HE 9797.7C4 C532pea 1988
3 5556 021 524 301

KPMG Peat Marwick

Airport Consulting Services

Final Report

Chicago O'Hare International Airport Expansion Analysis

Prepared for

Illinois Department of Transportation
Indiana Department of Transportation
Wisconsin Department of Transportation

August 1988

Peat Marwick Main & Co., Airport Consulting Services
Post Office Box 8007 • San Francisco International Airport • San Francisco, California 94128-8007 • 415-571-7722

TRAN
HE
9797.7C4
C532peq
1988

CONTENTS

Chapter		Page
1	INTRODUCTION	1
	Purpose of the Analysis	1
	Contents of this Report	2
2	DATA SOURCES AND ASSUMPTIONS	3
	Sources of Data	3
	Assumptions	3
3	FORECASTS OF AVIATION ACTIVITY	4
	Forecasts of Aviation Activity for Case 4	4
	Historical and Forecast Enplaning Passengers and Aircraft Operations by Type of Operator	6
	Historical and Forecast Commercial Aircraft Mix	8
	Aircraft Fleet Mix and Aircraft Characteristics	8
	Sensitivity Analysis	12
4	AIRPORT REQUIREMENTS	17
	Aircraft Parking Positions and Concourse Frontage Requirements	17
	Aircraft Parking Positions	17
	Concourse Frontage	18
	Sensitivity Analysis	18
	Terminal Building Requirements	22
	Airside Building	22
	Landside Building	22
	Parking Requirements	23
	Other Principal Airport Land Uses	23
	Sensitivity Analysis	25
5	SKETCH PLAN EXPANSION CONCEPT	26
	Alternative Sites for Terminal Development	26
	Selection of Terminal Site	26
	Description of Potential Passenger Terminal Facilities	27
	Design Aircraft	27
	Airside/Landside Terminal Concept	27
	Parking	27

Digitized by the Internet Archive
in 2012 with funding from
CARLI: Consortium of Academic and Research Libraries in Illinois

http://www.archive.org/details/chicagoohareinte00kpmg

CONTENTS (Continued)

Chapter		Page
5	People Mover	30
	Access	30
	Other Facilities	31
6	AIRPORT ACCESS	32
	Airport Access Travel Volumes	32
	Highway Travel	32
	Mass Transit Travel	33
	Traffic Assignment	35
	Off-Airport Roadway Expansion Requirements	40
	Expressway Expansion	40
	Arterial Expansion	42
	On-Airport Access Roadway Improvements	44
7	CAPITAL COSTS	45
	Introduction	45
	Cost Estimates	45
	Land Acquisition	45
	Utility Removal or Replacement	45
	New Utilities	47
	Earthwork	47
	Airfield Paving	47
	Terminal Area Construction	48
	Off-Airport Transportation	48
	On-Airport Transportation	49
	Summary	49
8	SOCIOECONOMIC AND POLITICAL ISSUES	50
	Introduction	50
	Support of Continued Expansion of O'Hare	51
	Surrounding Commercial Development	51
	The Role of Increased Passengers	51
	Limitations of the Existing Infrastructure	52
	Airline Operations in the Region	52
	Opposition to Continued Expansion of O'Hare	53
	Disruption of Existing Communities	53
	Safety and Environmental Problems	54
	Economic Benefits of Connecting Passengers	54

CONTENTS (Continued)

Chapter		Page
8	Managing Land Development	54
	Airport Employee Transportation	55
	Support for Developing a Supplemental Airport Elsewhere in the Region	55
	Adoption of Public Support Positions	55
	Shared Regional Benefits	56
	Summary	56
9	OTHER CONSIDERATIONS REGARDING AIRPORT EXPANSION	58
	Operation of the Western Terminal	58
	Disadvantages	58
	Advantages	58
	Aircraft Taxiing and Aircraft Delays	60
	Taxiing	60
	Airfield Delays	60
	Runway Crossing Delays	61
	Aircraft Noise	61
	Accommodation of Lesser Demand Levels	61
	Construction Delays	61
10	SUMMARY OF EVALUATION	62
	Principal Findings	62
	Airport Average Aircraft Mix and Aircraft Characteristics	62
	Aircraft Parking Requirements	63
	Location of Future Terminal Development	63
	Access	63
	Capital Costs	63
	Social and Political Considerations	66
	Other Considerations	66
	Summary of Evaluation	67

TABLES

		Page
1	Forecast Annual Enplaning Passengers: Case 4	5
2	Historical and Forecast Enplaning Passengers by Type of Operator	7

CONTENTS (Continued)

Table		Page
3	Historical and Forecast Aircraft Operations by Type of Operator	9
4	Aircraft Fleet Mix and Aircraft Characteristics	10
5	Aircraft Operations by Type of Aircraft and Operator	13
6	Aircraft Mix for Different Assumptions of Seats per Aircraft	15
7	Terminal Requirements	19
8	Aircraft Parking Position Requirements for Three Aircraft Mix Scenarios	20
9	Other Facility Requirements	24
10	Airport Access Volumes	34
11	Incremental Arterial Roadway Expansion Requirements	43
12	Summary of Cost Estimates for O'Hare Expansion Concept: Case 4	46
13	Summary of Evaluation of O'Hare Expansion	68

EXHIBITS

		Page
A	Future Airport Sketch Chicago O'Hare International Airport	29
B	2020 Incremental Average Daily Traffic Volumes on Expressways Near the Airport	36
C	2020 Incremental Average Daily Vehicle Volumes on Roadways Entering the Airport	37

CONTENTS (Concluded)

Exhibit		Page
D	Expressway Capacity Deficiencies for 2020 Assignment with 41.2 Million Enplaning Passengers.....	38
E	Expressway Capacity Deficiencies for 2020 Assignment with 60 Million Enplaning Passengers.....	39
F	Highway Improvements Required for 2020 Incremental Traffic.....	41

Chapter 1

INTRODUCTION

PURPOSE OF THE ANALYSIS

This report presents the findings of the Chicago O'Hare International Airport Expansion Analysis conducted for the Chicago Airport Capacity Study. The analysis provides a "sketch plan" evaluation of Airport expansion, in terms of the following factors:

- The ability to develop Chicago O'Hare International Airport to accommodate 60 million enplaning passengers and 920,000 aircraft operations with the existing runways and airport boundaries
- The ability of the off-Airport access system to accommodate airport access traffic

The following elements of the Airport were analyzed: (1) aircraft parking positions, (2) terminal buildings, (3) terminal curbside, (4) automobile parking, (5) other principal Airport land uses, and (6) on- and off-Airport access. One expansion concept was developed and evaluated--the scope of this assignment did not call for an analysis of alternative concepts.

The analyses were to identify the facility requirements for and implications of increasing the number of enplaning passengers at O'Hare from 41.2 million (the number of enplaning passengers assumed in the 1995 Master Plan) to 60 million (the number of enplaning passengers assumed in Case 4 of the Chicago Airport Capacity Study).

The results of this analysis were used as an element of the Chicago Airport Capacity Study for comparison with evaluations of alternative sites for construction of a supplemental airport.

This study was conducted at a system plan level of detail--the same level as other evaluations in the Chicago Airport Capacity Study.*

---

*Peat Marwick, "Final Report, Chicago Airport Capacity Study," May 1988.

CONTENTS OF THIS REPORT

Including this introduction, the report contains 10 chapters:

Chapter 2 describes the sources of data and assumptions that were used to determine facility requirements for expanding the Airport to accommodate the forecast demand.

Chapter 3 presents detailed forecasts of passengers and aircraft operations for Case 4 for 2020.

Chapter 4 presents Airport requirements for aircraft parking positions, terminal building area, automobile parking, and other facilities.

Chapter 5 presents Peat Marwick's expansion concept, including a sketch plan of the Airport and a description of the required facilities.

Chapter 6 presents analyses of off- and on-Airport access roadway requirements. The Chicago Area Transportation Study's (CATS) highway network model was used for analyses of off-Airport roadway vehicle volumes and access traffic volumes at the Airport entrances.

Chapter 7 presents estimates of Airport and highway construction capital costs prepared by McDonough Associates, Inc.

Chapter 8 presents an evaluation of political and socio-economic issues related to expansion of O'Hare prepared by The al Chalabi Group, Ltd.

Chapter 9 presents discussions of other considerations pertaining to Airport expansion.

Chapter 10 summarizes the findings and presents the Consultant's conclusions.

Chapter 2

DATA SOURCES AND ASSUMPTIONS

SOURCES OF DATA

The sources of data used to determine facility requirements for expanding the Airport included the following:

- The City of Chicago Department of Aviation and its consultant
- The Chicago Area Transportation Study
- The O'Hare Master Plan, dated March 1984
- The O'Hare Environmental Impact Statement, dated May 1984
- Interviews with public officials

The analyses were made on the basis of available data, and no new surveys of Airport activity were conducted.

The City of Chicago provided data on historical and forecast aviation activity. Forecast aviation activity for 1995 was provided in the O'Hare Master Plan.

ASSUMPTIONS

The basic assumptions for the O'Hare Expansion Analysis for 2020 were established by the Policy Committee based on Case 4 of the Chicago Airport Capacity Study and are as follows:

- 920,000 total annual aircraft operations
- 866,000 annual commercial aircraft operations (domestic and international air carrier, commuter, and air taxi)
- 216 average seats per aircraft
- 65% average enplaning load factor
- 140 average enplaning passengers per departure
- 60,000,000 annual enplaning passengers
- Existing runways and Airport boundaries

Chapter 3

FORECASTS OF AVIATION ACTIVITY

Detailed forecasts of aviation activity were developed for the year 2020 under Case 4 of the Chicago Airport Capacity Study. The forecasts were based on historical aviation activity and City of Chicago forecasts for 1995.

FORECASTS OF AVIATION ACTIVITY FOR CASE 4

The Policy Committee for the Chicago Airport Capacity Study adopted the forecast of aviation activity for Case 4 shown in Table 1. In 1985, nearly 25 million passengers enplaned at O'Hare. For the purposes of the Chicago Airport Capacity Study, it was agreed that 40 million passengers would enplane at O'Hare, Midway, and Meigs in 1995. However, the City of Chicago forecasts in the O'Hare Master Plan are for 41,178,930 million enplaning passengers in 1995. For demand Case 4 for the Chicago Airport Capacity Study, 60,000,000 passengers would enplane at O'Hare in 2020. The latter two forecasts were used in this analysis to determine facility requirements.

In 1985, 746,671 aircraft operations (682,216 commercial aircraft operations) were accomplished at O'Hare. The City of Chicago forecast that aircraft operations would increase to 920,000 annually (866,000 commercial aircraft operations) in the year 2020. Those numbers of aircraft operations are based on assumptions regarding future improvements in air traffic control systems. In the summary of the Final Environmental Impact Statement for Chicago O'Hare International Airport, May 1984, the following Statement was made by the FAA with regard to airspace:

> "A number of subsequent Federal actions will be required to achieve the 1995 operational levels anticipated of 920,600 annual operations, 2,878 peak month average day operations. These Federal actions include, but are not limited to the following:
>
> A. Modify 14 CFR Part 93, High Density Traffic
>
> B. Implement a vortex avoidance system (VAS)
>
> C. Implement air traffic control procedures--separation between aircraft

Table 1

FORECAST ANNUAL ENPLANING PASSENGERS: CASE 4
O'Hare Operating at 65% Load Factor, 216 Seats per Departure,
and 866,000 Commercial Operations
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study
1985-2020

These forecasts have been prepared on the basis of the information and assumptions given in reports issued in the Chicago Airport Capacity Study. The achievement of any forecast is dependent upon the occurrence of future events which cannot be assured. Therefore, the actual results may vary from the forecasts.

	Actual	Forecast				
	1985[a]	1995	2000	2005	2010	2020
Unconstrained demand total Chicago region:						
Enplaning passengers	26,172,000	40,000,000	45,000,000	50,000,000	55,000,000	65,000,000
Constrained demand accommodated at O'Hare:						
Enplaning passengers	24,876,000	37,360,000	41,800,000	46,300,000	50,800,000	60,000,000
Commercial aircraft operations	682,216	795,000	844,000	866,000	866,000	866,000
Seats per aircraft	141	160	168	182	194	216
Load factor	52	58	59	59	60	65
Enplanements per departure	73	94	99	107	118	140
Demand accommodated at Midway and Meigs:						
Enplaning passengers	1,296,000	2,640,000	3,200,000	3,700,000	4,200,000	5,000,000
Demand not accommodated at O'Hare, Midway, and Meigs:						
Enplaning passengers	--	--	--	--	--	--

a. City of Chicago.

Source: Peat Marwick, May 1988.

D. Implement air traffic control procedures--IFR conditions

E. Upgrade the existing airport surface surveillance capability

It should be noted that a determination has not been made by the FAA regarding the safety or feasibility of these systems. The complexity of the issues surrounding the above items make it extremely difficult to forecast their development. If the Federal Aviation Administration (FAA) determines at a later date that all or some of these systems cannot be implemented at O'Hare, the 1995 demand projections [920,600 operations] may not be realized."

The forecasts for Case 4 are that the average number of seats per aircraft would increase from about 141 in 1985, to 163* in 1995, and to 216 in 2020. Enplaning load factors would increase from about 52% in 1985, to 58% in 1995, and to 65% in 2020. The resulting number of enplaning passengers per departure would increase from about 73 in 1985, to 95* in 1995, and to 140 in 2020.

This analysis is based on the above-mentioned factors regarding average seats per aircraft, enplaning load factors, and annual aircraft operations. The combination of those factors, as described for 2020, is required to achieve the 60 million enplaning passenger activity level at O'Hare in Case 4. Other cases with lesser passenger activity levels at O'Hare were not considered.

HISTORICAL AND FORECAST ENPLANING PASSENGERS AND AIRCRAFT OPERATIONS BY TYPE OF OPERATOR

Table 2 shows historical and forecast enplaning passengers, by type of operator, for 1985, 1995, and 2020. Historical data and forecasts for 1995 of enplaning passengers were provided in Airport Management Records. Forecasts of enplaning passengers for 2020 were projected on the basis of the 1995 forecasts.

---

*Based on the O'Hare Master Plan, 163 seats per aircraft relates to the forecasts of 41,178,930 enplaning passenger and 866,000 commercial aircraft operations for 1995.

Table 2

HISTORICAL AND FORECAST ENPLANING PASSENGERS BY TYPE OF OPERATOR
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study
1985, 1995, and 2020

Type of operator	Annual enplaning passengers 1985	1995	2020
Domestic airlines, domestic flights	22,359,749	36,653,218	53,406,000
Domestic airlines, international flights	837,360	1,372,642	1,998,000
Foreign flag international	825,805	2,589,270	3,774,000
Commuter	840,939	550,400	804,000
Air taxi	3,777	13,400	18,000
All cargo	246	--	--
Military	4,745	--	--
General aviation	46,120	--	--
Other	10,545	--	--
Total	24,929,286	41,178,930	60,000,000

	Average day peak month enplaning passengers		
Domestic airline, domestic flights	69,748	123,727	180,890
Domestic airline, international flights	2,612	4,633	6,770
Foreign flag international	2,781	10,110	14,730
Commuter	2,115	1,900	2,780
Air taxi	8	70	90
All cargo	0	--	--
Military	14	--	--
General aviation	125	--	--
Other	--	--	--
Total	77,403	140,440	205,260

Source: 1985, 1995: City of Chicago Airport Management Records, Table 3.
2020: projected on basis of 1995 percentages. Peat Marwick, May 1988.

The Master Plan forecasts indicate that total enplaning passengers will increase by an average of 5% annually from 1985 to 1995. That rate would decline to an average of about 1.5% annually from 1995 to 2020.

The Master Plan forecasts indicate that commuter enplaning passengers will decline from 840,939 in 1985 to 550,400 in 1995. Commuter enplaning passengers in 2020 were forecast to be the same percentage of total passengers as forecast for 1995.

The Master Plan forecasts indicate that peak month enplaning passengers will increase as a percentage of the year from 1985 to 1995. Peak month domestic enplaning passenger activity will increase from 9.7% of annual activity in 1985 to 10.5% in 1995. Average day, peak month forecasts for activity in 2020 are based on the same percentage as in 1995.

Table 3 shows historical and forecast aircraft operations, by type of operator, for 1985, 1995, and 2020. Historical data and forecasts of aircraft operations for 1995 were provided in Airport Management Records. Forecasts of aircraft operations for 2020 are the same as for 1995.

The Master Plan forecasts indicate that total peak month aircraft operations will increase as a percentage of the year's operations from 1985 to 1995. Peak month domestic airline aircraft operations will increase from 9.1% of annual aircraft operations in 1985 to 9.6% in 1995.

HISTORICAL AND FORECAST COMMERCIAL AIRCRAFT MIX

Aircraft Fleet Mix and Aircraft Characteristics

The Airport aircraft fleet mix for the 60 million enplaning passenger activity level was developed by Peat Marwick to reflect an average of 216 seats per aircraft. The fleet mix shown in Table 4 was based on the following assumptions:

- Typical seats per aircraft were based on information from the Airline Seating Guide* for United Airlines and American Airlines.

---

*Airline Seating Guide, U.S. Edition, published by Carlson Publishing Company.

Table 3

HISTORICAL AND FORECAST AIRCRAFT OPERATIONS BY TYPE OF OPERATOR
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study

	Annual aircraft operations		
	1985	1995	2020
Type of operator			
Domestic airline, domestic flights	565,876	722,154	722,154
Domestic airline, international flights	14,031	17,906	17,906
Foreign flag international	14,009	13,500	13,500
Commuter	86,380	103,650	103,650
Air taxi	1,948	8,460	8,460
All cargo	22,695	23,370	23,370
Military	3,428	460	460
General aviation	29,620	31,100	31,100
Other	8,684	--	--
Total	746,671	920,600	920,600

	Average day peak month aircraft operations		
Domestic airline, domestic flights	1,661	2,225	2,225
Domestic airline, international flights	41	55	55
Foreign flag international	54	44	44
Commuter	234	326	326
Air taxi	3	34	34
All cargo	67	82	82
Military	10	2	2
General aviation	83	110	110
Other	--	--	--
Total	2,153	2,878	2,878

Source: 1985, 1995: City of Chicago Airport Management Records, Table 3.
2020: Projected on basis of 1995 percentages by Peat Marwick, May 1988.

Table 4

AIRCRAFT FLEET MIX AND AIRCRAFT CHARACTERISTICS
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study
2020

Typical aircraft type	Typical seats per aircraft	Typical gate occupancy time (minutes)[a]	Typical wingspan[b]	Percent of total commercial operations
B-747	386	60	226	12.0%
DC-10	260	60	182	17.0
L-1011	270	60	192	16.0
A-300	252	60	173	12.0
B-767	197	55	182	8.0
B-757	185	55	151	5.0
MD-80	142	50	128	7.0
B-737-300	138	40	115	6.0
BAe-146-200[a]	100	40	107	4.0
Dash 7[a]	50	--	--	8.0
Embraer Bandeirante or BH-99[a]	17	--	--	5.0
Total/average	216	56	174	100.0%

a. Domestic operations.
b. Commuter aircraft were excluded from the gate occupancy and concourse frontage calculations. Typical wingspan includes wingtip clearances.

Source: Peat Marwick, March 1988.

- Typical gate occupancy times were provided by United Airlines and American Airlines.

- Typical wingspans were obtained from aircraft specifications manuals. Wingtip clearances, based on accepted airport planning criteria and Peat Marwick experience at other U.S. airports, were added to the wingspans to determine concourse frontage required per aircraft parking position.

To reach an average of 216 seats per aircraft in 2020, the proportion of heavy aircraft in the aircraft mix would increase significantly from 1985. In 1985, there was an average of 141 seats per aircraft. In 1995, there would be an average of 163 seats per aircraft. From 1985 to 2020, the mix of commercial airline aircraft (defined as including domestic and international airlines and commuter airlines and air taxi aircraft) by aircraft weight class would change as follows:

Aircraft class[a]	1985	1995	2020
Class D	15%	32%	65%
Class C	84	56	30
Class B	1	12	5
	100%	100%	100%

a. Aircraft class is defined in terms of aircraft takeoff weights and performance characteristics:

Aircraft class	Takeoff weight (pounds)	Type of aircraft
D	300,000 or more	Heavy aircraft (such as B-747, B-767, DC-8-30/40/50/60 series, DC-10, L-1011, DC-8-62, A-300)
C	12,500 to 300,000	Large aircraft (such as Convair CV-580, B-727, DC-9, B-737, B-757)
B	12,500 or less and some Learjets	Small twin-engine aircraft (such as Piper PA-31, Beech BE-55, Cessna C-310, Learjet LR-25)

Because of the increasing percentage of widebody aircraft in the mix, average gate occupancy time per aircraft would increase from about 49 minutes in 1985, to 53 minutes in 1995, and to 56 minutes in 2020.

Average concourse frontage per aircraft would increase from about 133 feet in 1985, to 153 feet in 1995, and to 174 feet in 2020.

In Table 5, the airport average fleet mix is presented in terms of average day, peak month operations by type of operator. It was assumed that all of the foreign flag operators would operate B-747 aircraft. It was assumed that all of the commuter airlines and air taxi operators would use the smaller aircraft in the mix. The remaining aircraft operations would be by domestic airlines. For certificated domestic airlines only, about 75% of the aircraft mix would be widebody (heavy) aircraft.

Sensitivity Analysis

An analysis was conducted to determine the sensitivity of the aircraft mix to aircraft seating capacity. This analysis was conducted because the aircraft mix presented in the previous section included an extraordinarily high percentage of widebody aircraft.

In a review of the assumptions used in this study, the City of Chicago indicated its belief that airlines would maximize seats per aircraft on small and mid-size aircraft before switching to larger aircraft. The City suggested that calculations for the fleet mix for 2020 should assume the certificated maximum number of seats per aircraft for the small and mid-sized aircraft. By having more seats per aircraft, the small and mid-sized aircraft would constitute a larger portion of the aircraft mix.

In response to this comment, the aircraft fleet mix for 2020 was recalculated with increased seats per aircraft. Three alternate scenarios were considered as follows:

1. The forecast aircraft mix for 2020, described in the previous section

2. An aircraft mix calculated using the following:

   - Increased seats per aircraft for the small and mid-sized aircraft (class C) and the B-767 aircraft (in class D)

Table 5

AIRCRAFT OPERATIONS BY TYPE OF AIRCRAFT AND OPERATOR
Chicago O'Hare International Airport Expansion Analysis
Average Day, Peak Month, 2020
Chicago Airport Capacity Study

Typical aircraft type	Average day, peak month operations: Domestic carriers	Foreign flag	Commuter
B-747	278	44	0
DC-10	456	0	0
L-1011	429	0	0
A-300	322	0	0
B-767	215	0	0
B-757	134	0	0
MD-80	188	0	0
B-737-300	161	0	0
BAe-146-200	96	0	11
DASH 7	0	0	215
Embraer Bandeirante or BH-99	0	0	134
	2,279[a]	44	360
Average seats per aircraft	241	386	39
Average gate occupancy per aircraft[b] (minutes)	56	144	--
Average concourse frontage per aircraft[b] (feet)	174	226	--

a. Total does not add to 2280 because of rounding.
b. Commuter aircraft were excluded from the gate occupancy and terminal frontage calculations.

Source: Peat Marwick, March 1988.

- The typical 1985 seats per aircraft for the widebody aircraft

3. An aircraft mix calculated using increased seats for all aircraft

For the smallest representative aircraft types (BH-99, Dash 7, BAe-146-200), the maximum number of seats suggested in the aircraft specification manuals were used. For the mid-sized aircraft (B-737-300, MD-80, B-757) and B-767, the maximum number of seats for mixed-class seating suggested in the aircraft specification manuals were used.

For these three aircraft mix scenarios, Table 6 shows the associated terminal frontage and average gate occupancy time required per aircraft.

The aircraft types used for these calculations are intended only to represent the types and sizes of aircraft that would operate at O'Hare in the future. In the future, new aircraft types may be introduced with similar characteristics in respect to airport planning considerations.

In the original forecast aircraft mix scenario, widebody aircraft would constitute 65% of the aircraft mix, 62% in the second scenario, and 56% in the third scenario. In all three scenarios, the Airport average seats per aircraft would be 216.

The average concourse frontage per aircraft (including wingtip clearances) would be 174 feet for the original forecast aircraft mix scenario, 171 feet for the second scenario, and 165 for the third scenario.

On the basis of this analysis, it is concluded that heavy aircraft would constitute a large percentage of the aircraft mix in order to achieve 216 seats per aircraft. Further, the aircraft mix (and the gate occupancy times and frontage requirements) would not be affected significantly by the increases in the number of seats that were considered.

Peat Marwick believes that airlines will not increase seats per aircraft significantly above the current levels. Peat Marwick's observation is that the increases since deregulation have been such that, in coach, the seating densities have been increased as much as passengers will tolerate. This conclusion is supported by the fact that no significant increases in seating densities have taken place in the last two years.

Table 6

AIRCRAFT MIX FOR DIFFERENT ASSUMPTIONS OF SEATS PER AIRCRAFT
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study

Scenario 1: Peat Marwick forecast aircraft mix assuming existing seats per aircraft

Typical aircraft type	Existing typical seats per aircraft[a]	2020 aircraft mix	2020 percent of all seats
B-747	386	12%	21%
DC-10	260	17%	20%
L-1011	270	16%	20%
A-300	252	12%	14%
B-767	197	8%	7%
B-757	185	5%	4%
B-727-200	145	0%	0%
MD-80	142	7%	5%
B-737-300	138	6%	4%
BAe-146-200	100	4%	2%
DASH 7	50	8%	2%
Embraer Bandeirante or BH-99	17	5%	<1%
Total		100%	100%
Average seats per aircraft	216		
Average concourse frontage per aircraft (feet)	174		
Average gate occupancy time per aircraft (minutes)	56		

Scenario 2: Forecast assuming increased seats per aircraft for small and mid-size aircraft (up to B-767)

Typical aircraft type	Increased typical seats per aircraft[b]	2020 aircraft mix	2020 percent of all seats
B-747	386	9%	16%
DC-10	260	16%	19%
L-1011	270	15%	19%
A-300	252	12%	14%
B-767	254	10%	12%
B-757	186	8%	7%
B-727-200	145	0%	0%
MD-80	155	7%	5%
B-737-300	149	6%	4%
BAe-146-200	106	4%	2%
DASH 7	50	8%	2%
Embraer Bandeirante or BH-99	17	5%	<1%
Total		100%	100%
Average seats per aircraft	216		
Average concourse frontage per aircraft (feet)	171		
Average gate occupancy time per aircraft (minutes)	56		

Scenario 3: Forecast assuming increased seats per aircraft for all aircraft

Typical aircraft type	Increased typical seats per aircraft[c]	2020 aircraft mix	2020 percent of all seats
B-747	440	9%	18%
DC-10	270	15%	19%
L-1011	280	14%	18%
A-300	281	11%	14%
B-767	254	7%	8%
B-757	186	6%	5%
B-727-200	145	0%	0%
MD-80	155	8%	6%
B-737-300	149	7%	5%
BAe-146-200	106	8%	4%
DASH 7	50	9%	2%
Embraer Bandeirante or BH-99	17	6%	<1%
Total		100%	100%
Average seats per aircraft	216		
Average concourse frontage per aircraft (feet)	165		
Average gate occupancy time per aircraft (minutes)	54		

a. Airline Seating Guide for United Airlines and American Airlines aircraft.
b. Seating capacities increased to reflect maximum for BH-99, Dash 7, BAe-146-200; maximum "mixed class" seating for B-737-300, MD-80, B-757, and B-767. Source: Aircraft Specification Manuals for Airport Planning.
c. Seating capacities increased for all aircraft to reflect "mixed class" seating.

Source: Peat Marwick, May 1988.

In the requirements analysis and concept plan presented in the following chapters, the Peat Marwick aircraft mix was used. The sensitivity of the requirements analysis and the concept plan is addressed relative to the two additional scenarios.

Chapter 4

AIRPORT REQUIREMENTS

Airport requirements include (1) aircraft parking positions (aircraft gates), (2) concourse frontage, (3) terminal building footprint (second level area), (4) public and employee parking, (5) rental car acreage, (6) curbside length, and (7) cargo area. Requirements for aircraft parking positions and concourse frontage were the key factors in developing the terminal expansion concept.

AIRCRAFT PARKING POSITIONS AND CONCOURSE FRONTAGE REQUIREMENTS

Aircraft Parking Positions

Aircraft parking position requirements for the 60 million enplaned passenger activity level were determined using (1) 1986 gate utilization factors for each airline, (2) 2020 average day departures, and (3) 2020 average gate occupancy times (reflecting an aircraft mix with a greater percentage of larger aircraft and with a higher average occupancy time than in 1986).

The following data and assumptions were used to determine 1986 gate utilization factors for each airline:

- Peak month 1986 departures were tabulated by airline, based on City of Chicago records.
- Gate assignments for August 1986 were provided by Landrum & Brown.
- Domestic airline international operations were assumed to depart from the carrier's domestic gates. (Domestic airline international operations would arrive at the international terminal and then depart from their domestic gates. Therefore, aircraft parking position requirements for the international terminal do not reflect the occupancy times of domestic airline international arrivals.)
- Average gate occupancy times for domestic carriers were determined based on the occupancy times provided by United Airlines and American Airlines. (It was assumed that international departures by

domestic carriers would have gate occupancy times averaging 60 minutes.)

On the basis of those data, requirements for aircraft parking positions were estimated. For this analysis, the design volume is average day, peak month departures. It was assumed that the average day utilization for the 60 million enplaned passenger activity level would be the same as it is today. That is, it was assumed that the airlines are currently using the gates at O'Hare as efficiently as possible. Future gate utilization is expected to continue at the same level as today.

The results of the analysis are shown in Table 7. The increase in gate occupancy times over 1995 would result in an increase in required aircraft parking positions from 130 to 177 for domestic airlines and a decrease in departures per gate per day for domestic airlines from 8.8 to 6.4.

Concourse Frontage

On the basis of the total concourse frontage (at 100 feet from the building face) that would exist in 1995* and the average concourse frontage required per aircraft in 2020, the number of aircraft parking positions at the main terminal were determined. As shown in Table 7, 20,800 feet of concourse frontage would be provided at the main terminal, accommodating about 120 aircraft parking positions. That number of aircraft parking positions (120) was subtracted from the total aircraft parking position requirement (177) to determine the number of additional aircraft parking positions required (57).

Sensitivity Analysis

Analyses were conducted to determine the sensitivity of the (1) aircraft parking position requirements and (2) concourse frontage requirements to the aircraft mix.

Sensitivity of Requirements to Aircraft Mix. Table 8 shows the results of the analysis of the sensitivity of the requirements to the aircraft mix. The total number of

---

*Based on measurements provided by Landrum & Brown and shown in the Master Plan.

Table 7

TERMINAL REQUIREMENTS
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study
1985, 1995, and 2020

	1985	1995	2020
Aircraft parking positions and concourse frontage			
Domestic airlines			
Average concourse frontage required per aircraft[a]	133	160	174
Aircraft parking positions			
Aircraft departures, average day, peak month	851[b]	1,140[c]	1,140
Average occupancy time per aircraft (minutes)[d]	49	52	56
Number of aircraft parking positions required	103[e]	130	177
Departures per aircraft parking position per average day, peak month	8.3	8.8	6.4
Total concourse frontage (feet)	13,532[e]	20,800[f]	30,700
Total aircraft parking positions accommodated at main terminal			120
Additional aircraft parking positions required			57
Total concourse frontage at main terminal[f]			20,800
Additional concourse frontage required			9,900
Foreign flag airlines (International Terminal)			
Aircraft parking positions			
Departures, average day, peak month	27[b]	22[c]	22
Average occupancy time per aircraft[g]	144	144	144
Number of aircraft parking positions required	11	18	8
Departures per aircraft parking position per average day, peak month	2.5	1.2	2.8
Total concourse frontage	n.a.	3,470[f]	3,470
Commuter carriers			
Departures, average day, peak month	117[b]	163[c]	163
Number of aircraft parking positions at new terminal			7
Terminal building area footprint (second level area square feet)			
Total Airport airside area	614,938[h]	810,616[h]	1,185,000
Total airside area at main terminal			825,000
Additional airside area required			360,000
Total Airport landside area	542,881[h]	677,090[h]	990,000
Total landside area at main terminal			690,000
Additional landside area required			300,000

n.a. = not applicable

Note: Some data are rounded.

a. Based on wingspans and wingtip clearances for aircraft operating at the Airport. Aircraft mix from Airport Activity Statistics, 1985, and Peat Marwick forecast.
b. 1985: City of Chicago Department of Aviation, Airport Management Records. Tables 3 and 6.
c. 1995: Chicago O'Hare International Airport Master Plan, Volume XIV, "Airport Plans," July 1984.
d. Based on average gate occupancy times for United Airlines and American Airlines aircraft, from airline management, February 1988.
e. Historical data from Landrum & Brown.
f. Based on Chicago O'Hare International Airport Master Plan, Volume XIV, "Airport Plans," July 1984, and Landrum & Brown revisions, February 1988.
g. Based on average gate occupancy times from Chicago O'Hare International Airport Master Plan, Volume XIV, "Airport Plans," July 1984, and Landrum & Brown revisions, February 1988.
h. 1985 and 1995: City of Chicago, letter from Earl Hord, October 8, 1987.

Source: Peat Marwick, March 1988, except as noted.

Table 8

AIRCRAFT PARKING POSITION REQUIREMENTS FOR THREE AIRCRAFT MIX SCENARIOS
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study

Scenario 1: Peat Marwick forecast aircraft mix assuming existing seats per aircraft	
Domestic carriers	
Average concourse frontage required per aircraft	174
Departures, average day, peak month	1,140
Average occupancy time per aircraft (minutes)	56
Number of aircraft parking positions required	177
Departures per aircraft parking position per average day, peak month	6.4
Total concourse frontage required	30,700
Total aircraft parking positions at main terminal	120
Additional aircraft parking positions required	57
Total concourse frontage at main terminal	20,800
Additional concourse frontage required	9,900
Scenario 2: Forecast assuming increased seats per aircraft for small and mid-size aircraft (up to B-767)	
Domestic carriers	
Average concourse frontage required per aircraft	171
Departures, average day, peak month	1,140
Average occupancy time per aircraft (minutes)	56
Number of aircraft parking positions required	177
Departures per aircraft parking position per average day, peak month	6.4
Total concourse frontage required	30,200
Total aircraft parking positions at main terminal	122
Additional aircraft parking positions required	55
Total concourse frontage at main terminal	20,800
Additional concourse frontage required	9,400
Scenario 3: Forecast assuming increased seats per aircraft for all aircraft	
Domestic carriers	
Average concourse frontage required per aircraft	165
Departures, average day, peak month	1,140
Average occupancy time per aircraft (minutes)	54
Number of aircraft parking positions required	173
Departures per aircraft parking position per average day, peak month	6.6
Total concourse frontage required	28,500
Total aircraft parking positions at main terminal	126
Additional aircraft parking positions required	47
Total concourse frontage at main terminal	20,800
Additional concourse frontage required	7,800

Source: Peat Marwick, May 1988.

aircraft parking positions required for domestic air carriers would be 177 for the Peat Marwick forecast aircraft mix, 177 for the second scenario, and 173 for the third scenario.

The resulting requirement for additional aircraft parking positions would be 57 for the Peat Marwick forecast aircraft mix, 55 for the second scenario, and 47 for the third scenario.

The requirements for aircraft parking positions for the Peat Marwick forecast aircraft mix and for the second scenario do not vary significantly. The requirements are reduced significantly only when the maximum seats per aircraft are assumed for all aircraft. Therefore, it is concluded that the requirements are not sensitive to reasonable variations of the average number of seats per aircraft in the aircraft mix.

Sensitivity of Aircraft Parking Position Requirements to Gate Use Efficiency. The analysis of aircraft parking and concourse frontage requirements was conducted with the assumption that, on average, the airlines were using the gates at O'Hare as efficiently as possible in 1986 and will continue at the same level of efficiency in the future. The sensitivity of the requirements to increased gate use efficiency was analyzed based on suggestions by the City of Chicago that gate use efficiency may increase over time.

In this sensitivity analysis, it was assumed that all airlines would have 10% increased gate use efficiency from 1986 to 2020. With that increased gate use efficiency, 159 domestic airline aircraft parking positions would be required, compared to 177 determined in the original analysis. Based on the concourse frontage required per aircraft and the frontage for domestic airline aircraft parking that would exist at the main terminal, 120 domestic airline aircraft parking positions would be provided at the main terminal and 39 additional domestic airline aircraft parking positions would be required.

This analysis shows that the gate requirements are sensitive to gate use efficiency. The sensitivity of other airport requirements and of the expansion concept plan to increased gate use efficiency is discussed again in this report relative to this sensitivity analysis.

TERMINAL BUILDING REQUIREMENTS

The terminal was analyzed in terms of two components--an airside building with passenger concourses and aircraft gates and a landside building with ticketing and baggage handling functions. The terminal requirements are consistent with the requirements that were estimated for a supplemental airport in the Chicago Airport Capacity Study. On the basis of the number of aircraft parking positions that will be provided at the existing terminal and the number of additional aircraft parking positions that would be required, about 42 million passengers would enplane at the main terminal and 18 million passengers would enplane at an additional facility.

Airside Building

The requirements for the airside buildings footprint area are based on the assumption that future airline operational practices at the Airport will be similar to those today, (i.e., mostly exclusive use gates, approximately 50% connecting and 50% originating passengers).

As shown in Table 7, about 1,185,000 square feet of airside building footprint would be required to accommodate a 60 million enplaned passenger activity level of which 825,000 square feet will be provided at the airside buildings of the existing terminal and 360,000 square feet would be required at the airside buildings of a new terminal complex.

Landside Building

The requirements for the landside terminal footprint area are based on the assumption that future passenger processing functions and airline operational practices at the Airport will be similar to those today.

As shown in Table 7, about 990,000 square feet of landside building footprint would be required to accommodate a 60 million enplaned passenger activity level of which 690,000 square feet will be provided at the landside buildings of the existing terminal and 300,000 square feet would be required at the landside building of a new terminal.

Parking Requirements

The requirements for public and employee automobile parking, rental car acreage, and curbside length are shown in Table 9. The requirements are based on (1) the assumption that future modal choices and uses of these facilities will be similar to those today and (2) planning factors derived from the O'Hare Master Plan.

As shown in Table 9, about (1) 30,000 public parking spaces, (2) 22,200 employee parking spaces, (3) 85 acres of rental car areas, and (4) 18,700 effective linear feet of curbside would be required to accommodate the 60 million enplaned passenger activity level. Based on the Master Plan, of those requirements, (1) 20,590 public parking spaces, (2) 15,050 employee parking spaces, (3) 58 acres of rental car areas, and (4) 11,700 effective linear feet of curbside will be provided at the existing terminal. Facilities associated with the incremental Airport activity would be provided at a new terminal and include (1) 9,410 public parking spaces, (2) 7,150 employee parking spaces, (3) 27 acres of rental car areas, and (4) 7,000 linear feet of curbside.

Other Principal Airport Land Uses

The requirements for other Airport land uses include the following:

- As shown in Table 9 and based on the Master Plan, air cargo and freight forwarder facilities would occupy 176 acres in 1995. To accommodate the 60 million enplaned passenger activity level, 210 acres would be required.

- Airline hangar, maintenance, and flight kitchen areas would occupy 265 acres based on the Master Plan; to accommodate the 60 million enplaned passenger activity level, 310 acres would be required.

- General aviation operations would not increase from 1995 to 2020. Therefore, no increase in acreage is estimated for this activity.

Table 9

OTHER FACILITY REQUIREMENTS
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study
1985, 1995, 2020

	1985	1995	2020
Automobile parking (spaces)			
Public	13,656[a]	20,590[a]	30,000
Employee	n.a.	15,050[a]	22,200
Rental car acreage	n.a.	58[b]	85
Curbside length (linear feet)			
Main terminal	n.a.	n.a.	11,700[c]
Additional curbside required	n.a.	n.a.	7,000
Cargo area (acres)	n.a.	176[b]	210

n. a. = not available

a. 1985, 1995: City of Chicago, Letter from Mr. Earl Hord to Mr. Dan Haney, January 15, 1988, Table 2.
b. Chicago O'Hare International Airport Master Plan, "Airport Plans," Volume XIV--July 1984. Acreage calculated on the basis of 350 square feet per stall.
c. Chicago O'Hare International Airport Master Plan, "Landside Facility Requirements," Volume IX--April 1980.

Source: Peat Marwick, May 1988, except as noted.

Sensitivity Analysis

On the basis of the sensitivity of aircraft parking position requirements to increased gate use efficiency, the sensitivity of the other Airport facility requirements was estimated. Assuming 120 domestic airline aircraft parking positions at the main terminal (plus foreign flag airlines at the International Terminal) and 39 domestic airline aircraft parking positions at an additional facility, about 46 million passengers would enplane at the main terminal (and International Terminal) and 14 million passengers would enplane at an additional facility.

Additional landside and airside building space and automobile parking would be required at the main terminal and correspondingly fewer facilities would be required at an additional facility (relative to the requirements presented previously). In the event that the main terminal building and associated facilities are not expanded to accommodate the incremental passengers beyond the 41.8 million planned for in the master plan, passengers would incur lower levels of service than planned for in the master plan (and this expansion concept).

Chapter 5

SKETCH PLAN EXPANSION CONCEPT

ALTERNATIVE SITES FOR TERMINAL DEVELOPMENT

Three potential sites for developing new passenger terminal facilities were identified on the basis of the O'Hare Master Plan and discussions with City of Chicago and Landrum & Brown representatives. The three areas identified were as follows:

1. An undeveloped western area bounded by the approach surfaces for Runway 9R, Runway 9L, and Runway 4L, Runway 14R-32L and the western Airport boundary

2. An area immediately north of the existing terminal complex in which new terminal development would be contiguous with the existing terminal complex

3. An area northwest of the existing terminal complex southeast of the existing airline aircraft maintenance area, bounded by the Scenic Taxiway on the west, Runway 9L-27R on the south, Runway 4L-22R on the southeast, and Runway 14L-32R on the northeast.

These three sites were compared in the context of the following questions:

- Which site would have sufficient land to provide a contiguous area for the additional passenger terminal facilities required to accommodate the 60 million enplaned passenger activity level?

- Which site would permit construction of the additional passenger terminal facilities without unreasonable costs and with the least impact on the operation of the existing terminal and airfield?

- Which site would permit the highest degree of flexibility in developing of passenger terminal facilities, taxiway and apron layouts, and access roadway facilities?

SELECTION OF TERMINAL SITE

On the basis of comparison of the three sites, it was concluded that the undeveloped western area was the best

available site for the development of a new passenger terminal facility that would enable the Airport to accommodate 60 million enplaning passengers. Compared with the other two sites, only the undeveloped western area has a contiguous area large enough for developing the additional facilities required to accommodate the 60 million enplaned passenger activity level. The undeveloped western area would also permit the creation of a western access point which would preclude significant increases in congestion from increased vehicular traffic at the main terminal.

Although it might be desirable to continue expansion of the existing terminal area, significant expansion would require relocating Runway 9L-27R. Relocation of the runway would require relocating the U.S. Air Force property, and would have unknown airspace implications and aircraft noise impacts. Those problems could be significant. It was not practical at a sketch plan level of detail to determine the feasibility of relocating Runway 9L-27R. Furthermore, relocating Runway 9L-27R would still not provide a large enough contiguous area for all of the required passenger terminal facilities.

The area northwest of the existing terminal complex had the disadvantage of requiring relocation of existing facilities at the airline aircraft maintenance area to provide vehicular access to the site. That area also would not have sufficient area for development for all of the required passenger terminal facilities.

In summary, the undeveloped western area is the largest undeveloped area on the Airport available for terminal development. No other undeveloped areas were identified that would provide a contiguous area large enough for terminal development. It would be possible to conduct a major demolition and reconstruction program that would yield a more effective layout of terminal facilities to accommodate the 60 million enplaning passenger activity level. However, such a program would be very costly and disruptive and is beyond the scope of this analysis.

DESCRIPTION OF POTENTIAL PASSENGER TERMINAL FACILITIES

Design Aircraft

Based on FAA taxiway and taxilane separation criteria and FAR Part 77 imaginary surfaces, it was determined that the western area has sufficient area to provide dual taxiway/taxilane capability throughout the complex. The design aircraft for

taxilane/taxiway separations and aircraft parking limits was a Boeing 747-400. The design aircraft for Part 77 approach surface clearance was a Boeing 747-SP.

Airside/Landside Terminal Concept

The future Airport sketch for the development concept is shown on Exhibit A. The terminal concept is envisaged as an airside/landside design. The geometry of the airside concourses and the configuration of an intra-terminal people mover system would be similar to that at Hartsfield Atlanta International Airport. The terminal concept would provide the required facilities identified in Chapter 4.

The concept is dependent on providing a reliable "people mover" system and lends itself to either hubbing or origin/destination type airline operations.

The two airside concourses could be about 150 feet wide to permit installation of moving sidewalks along their centerlines.

The landside terminal building would be about 400 feet wide and 1,800 feet long with a 350-foot x 350-foot atrium in the center. Originating passengers would enter the landside terminal building by vehicle at "level 3." Terminating passengers would exit the terminal building at "level 2." A ground transportation center would be provided for commercial vehicles at "level 1" (ground level). Baggage handling and the transfer station for the intra-terminal and inter-terminal people mover stations would be provided below grade at "level -1." A five-floor parking garage would be provided above the terminal. The overall height of the terminal building would not penetrate FAR Part 77 surfaces. Additional public parking, employee parking, and rental car parking would be provided in lots adjacent to the terminal on Airport property.

Because of the limited space for development in the undeveloped western area, some required terminal support facilities that are often built at grade--such as rental car parking and commercial vehicle staging areas--would have to be constructed as integral structural elements of the new terminal building.

Parking

Public parking in the terminal would provide convenient public circulation and require very short walking distances.

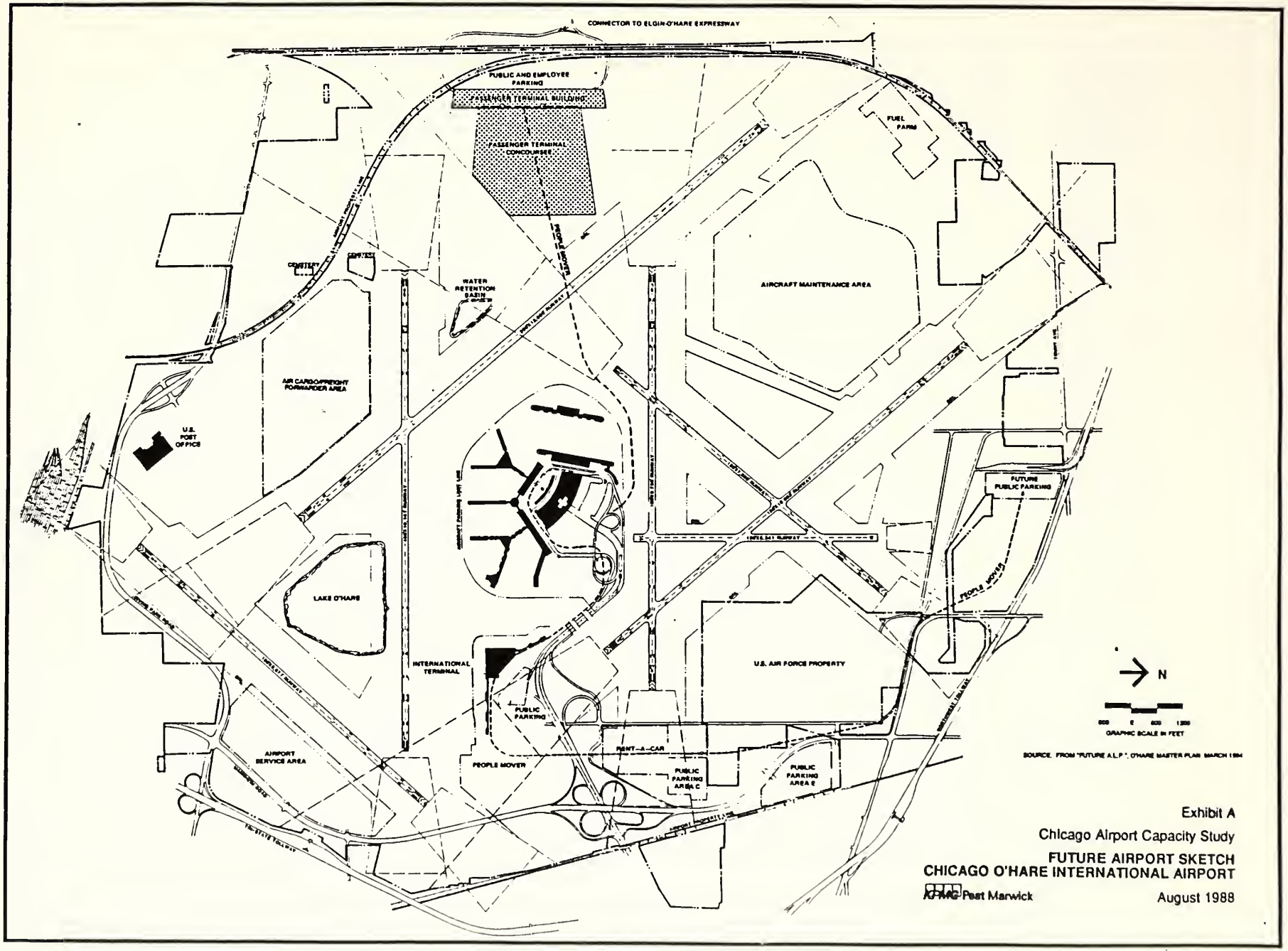


Exhibit A

Chicago Airport Capacity Study

FUTURE AIRPORT SKETCH
CHICAGO O'HARE INTERNATIONAL AIRPORT

KMG Peat Marwick

August 1988

Passengers who park in the garage would proceed directly via elevators to the ticketing, baggage claim, or people mover transfer station. Passengers who use commercial ground transportation would also be served conveniently.

People Mover

An inter-terminal people mover/baggage transfer system would be provided to connect the west landside terminal to the central core location that has been planned for the existing terminal. Because it would have to pass under the airfield between the two terminals, this system would be located below grade. Otherwise, the system would have to follow a very circuitous route along the perimeter of the Airport.

Construction of the western passenger terminal facility would produce minimal interruptions to existing operations. However, construction of the inter-terminal people mover/ baggage transfer system would be costly and difficult to route throughout the structures and utilities of the existing terminal complex. Construction of the system would temporarily impact the operations of aircraft on runways, taxiways, and aprons and of vehicles on the terminal circulation road at the main terminal during the construction period.

Access

The primary access to the western terminal would be via a three lane expressway spur (in each direction) from the proposed Elgin-O'Hare Expressway adjacent to the Airport. On-Airport roadways would consist primarily of a loop road across the western facade of the landside terminal. The roadway would be elevated over the existing railroad tracks.* From the elevated section, the roadway would transition to ramps serving three levels of the landside terminal.

---

*It is possible that the railroad tracks could be depressed. However, information provided by Landrum & Brown indicates that the cost to depress the railroad tracks would be prohibitive.

Other Facilities

Other facilities that would be required include the following:

- A ground operations control tower operated by the airlines
- Service roads from the western terminal to the existing terminal, the maintenance area, and the cargo area. (The service road connecting the western and main terminals would tunnel underneath Runway 14R-32L.)
- Increased aircraft fuel storage capacity
- Increased area for cargo and airline facilities
- A major heating, ventilation, and air conditioning system
- Increased lanes on existing on-Airport service roads and off-Airport roads leading to Airport service road entrances (see Chapter 6)

Chapter 6

AIRPORT ACCESS

This chapter discusses the airport access implications of increasing the number of originating passengers at Chicago O'Hare International Airport from 19,800,000 (the number assumed in the Master Plan associated with 41,200,000 enplaning passengers) to 28,800,000 (associated with 65,000,000 enplaning passengers) in Case 4.

The results of the airport access analysis indicated (1) the incremental vehicle volumes associated with the increase in enplaning passenger at O'Hare from 1995 to 2020, and (2) the ability of the roadway system to accommodate the incremental demand. The following sections describe (1) airport access travel volumes, (2) CATS traffic assignments for 1995 and 2020, (3) off-Airport roadway expansion requirements, and (4) on-Airport access roadway improvements.

AIRPORT ACCESS TRAVEL VOLUMES

Airport access traffic consists of vehicles used by originating and terminating passengers, airport employees, and airport and building services. This section describes assumptions regarding access modes and estimated vehicle volumes associated with the expanded Airport.

Highway Travel

Trips to the Airport related to originating passengers were estimated on the basis of previous CATS planning studies. A 1983 passenger survey determined that there were about 1.32 vehicles per originating passenger entering the Airport by the main access roads.

For the 60 million passenger activity level, it is estimated that there would be about 76 million vehicles entering and exiting the Airport on the main access roads annually; there would be about 260,100 vehicles entering and exiting during the average day, peak month.

Peak hour, average day, peak month originating passengers were estimated based on data from the Master Plan and Airport Management Records. The number of passengers in the peak hour was assumed to be about 7.8% of the number of passengers in

the average day, peak month. Some 20,300 vehicles would enter and exit the Airport in the peak hour of the average day, peak month.

There are two ways in which persons could travel to a western passenger terminal facility: (1) by expressway or arterial streets to the entrance of the western terminal and (2) by expressway or arterial streets to the entrance of the existing terminal and then by the underground people mover to the entrance of the western terminal. Many of the originating passengers whose trips begin west of the Airport would use the western terminal and probably travel directly to the western entrance. Originating passengers traveling from other directions might consider the two options. Even though the expressways would be congested (as described later in this chapter), it was assumed that all travelers would prefer traveling by highway directly to the western entrance rather than parking in the eastern parking lots and using the people mover. The basis for this assumption is that parking at the western terminal would be very convenient and would not require a change in access modes.

Average daily access vehicle volumes entering and exiting the major access points at the Airport are shown in Table 10. The vehicle volumes entering and exiting the Airport at the northern and eastern access points would not increase significantly from 1995 to 2020, because the number of passengers served at the main terminal would not increase significantly. In total, 260,100 vehicles would enter and exit the terminal areas via the O'Hare Access Road (I-190), Mannheim Road, and the western access road.

Mass Transit Travel

Currently, air passenger travel by bus is estimated to be 10% to 13% of total passenger trips;* air passenger travel by Chicago Transit Authority (CTA) trains is less than 2%. Bus trips include airport, charter, and public buses. No other data were available to quantify passenger trips by public bus or by CTA trains. If the western terminal were placed in service, the percentage of passenger trips by mass transit would not be expected to increase substantially.

---

*Source: City of Chicago, "Survey of Domestic Passenger Access/Parking Characteristics," Tables A-4 and A-9, May 1983.

Table 10

AIRPORT ACCESS VOLUMES
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study
1995 and 2020

	1995	2020 Total	2020 Incremental
Vehicle flow, two ways, entering and exiting the Airport (average day, peak month) (thousands)			
Main terminal			
O'Hare Access Road (I-190)	123.3	125.0	1.7
Old Mannheim Road	55.6	57.1	1.5
Western terminal from York Road and the proposed Elgin-O'Hare Expressway	--	78.0	78.0
Total	178.9	260.1	81.2
Northern maintenance area from Prospect Avenue	37.8	53.8	16.0
Freight forwarder/cargo area from Irving Park Road	28.8	40.5	11.7
Southern airline service areas from Mannheim Road south of Lawrence Avenue	21.5	45.4	23.9
Total Airport	267.0	399.8	132.8
Vehicle flow (one-way) entering the terminal complex (peak hour, average day, peak month)			
Main terminal (including international terminal)	7,000	7,100	100
Western terminal	--	3,000	3,000

Source: Chicago Area Transportation Study, May 1988.

Historically, transit is not used extensively by air passengers. Even if transit use were to double or triple as a percentage of total passenger trips, the impact on roadway congestion would not be significant.

TRAFFIC ASSIGNMENT

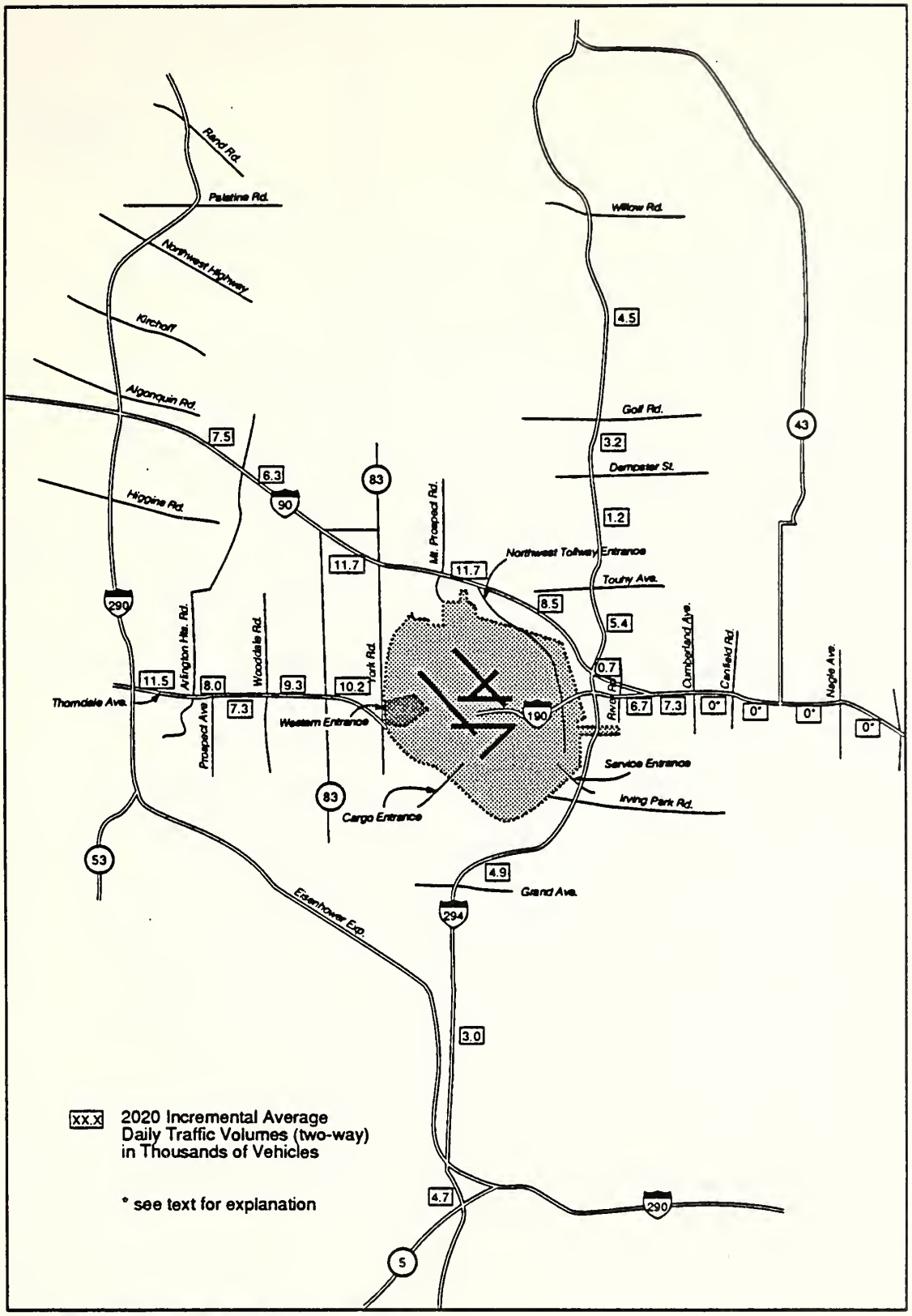
CATS performed traffic assignments using their year 2005 road network. To estimate the incremental vehicle volumes associated with increased passengers at the Airport from 1995 to 2020, the network was modified to provide a connection to a western passenger terminal facility.

Two assignments were made: (1) with non-Airport (background) travel estimated for the year 2020 and Airport traffic associated with 19,800,000 originating passengers (for 1995) and (2) with non-Airport travel estimated for the year 2020 and Airport traffic associated with 28,800,000 originating passengers (for 2020). The difference between these two assignments yields an estimate, on each link of the year 2005 road network, of the incremental traffic volumes associated with the incremental Airport passengers.

Exhibits B and C show the traffic assignment, in terms of incremental average daily traffic (ADT) volumes on the expressways in the vicinity of the Airport. As shown, the major increases in traffic on expressways would be on the proposed Elgin-O'Hare Expressway. This indicates the criticality of the proposed Elgin-O'Hare Expressway to providing a western access point. The traffic assignment model used by CATS estimated that traffic on some links of the Kennedy Expressway would not increase significantly, because traffic would already be severely congested. The traffic assignment model used by CATS assigns non-Airport vehicles to numerous arterial streets, when travel speeds on the Expressway deteriorate as congestion increases.

Exhibits D and E show expressway capacity deficiencies for the two traffic assignments. Expressway capacities at level of service D were determined by CATS. The capacities were based on planned and programmed roadway improvements through the year 2005. The exhibits show that all of the major expressways leading to the Airport would have capacity deficiencies for both assignments.

Traffic on the arterial streets was also estimated by CATS. Because so many arterial streets would be affected by traffic associated with the 60 million enplaning passenger activity



Source: Chicago Area Transportation Study, May 1988.

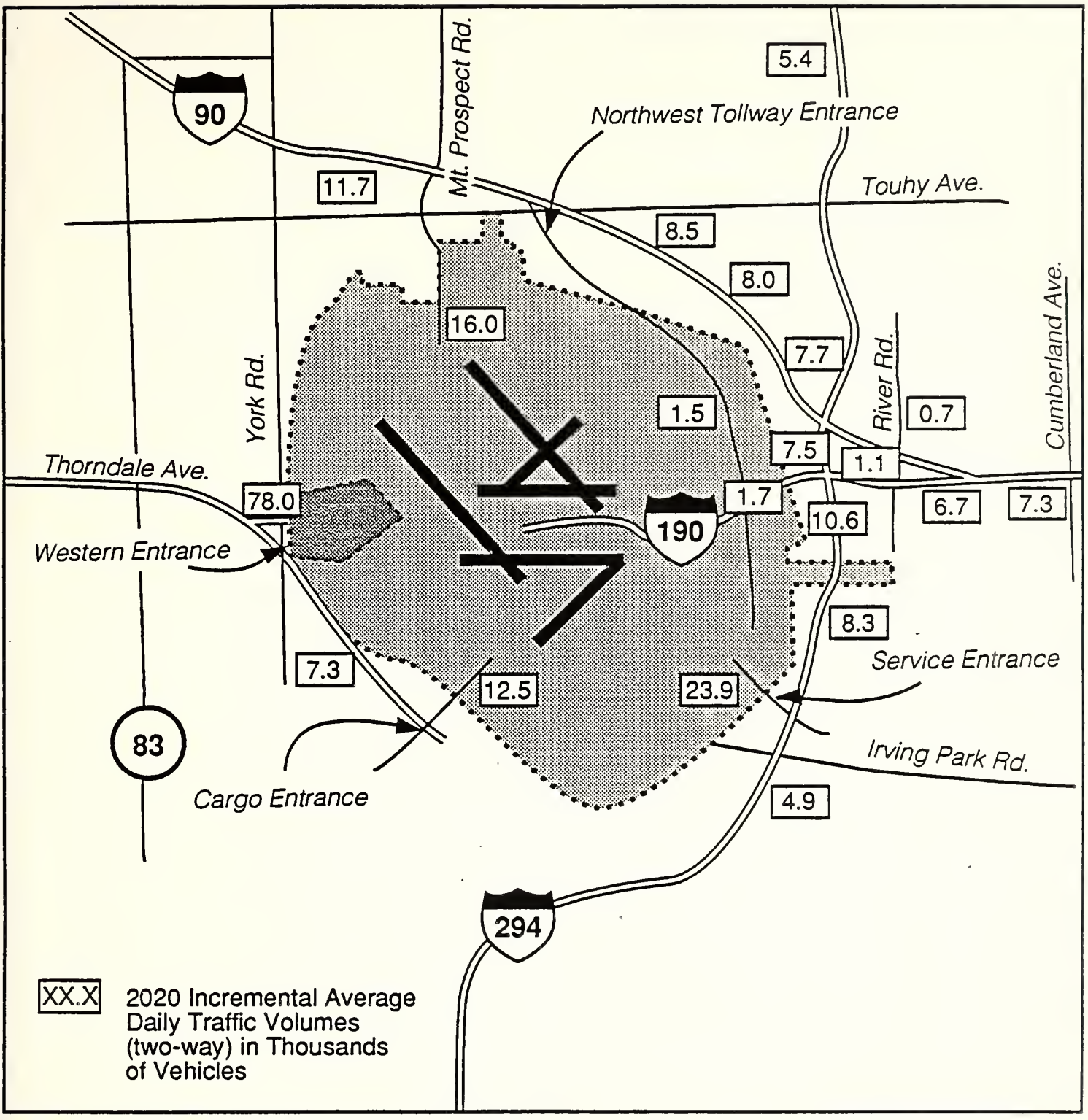
Exhibit B

Chicago O'Hare International Airport
Expansion Analysis

2020 INCREMENTAL AVERAGE DAILY TRAFFIC VOLUMES ON EXPRESSWAYS NEAR THE AIRPORT

KPMG Peat Marwick

August 1988



Source: Chicago Area Transportation Study, May 1988.

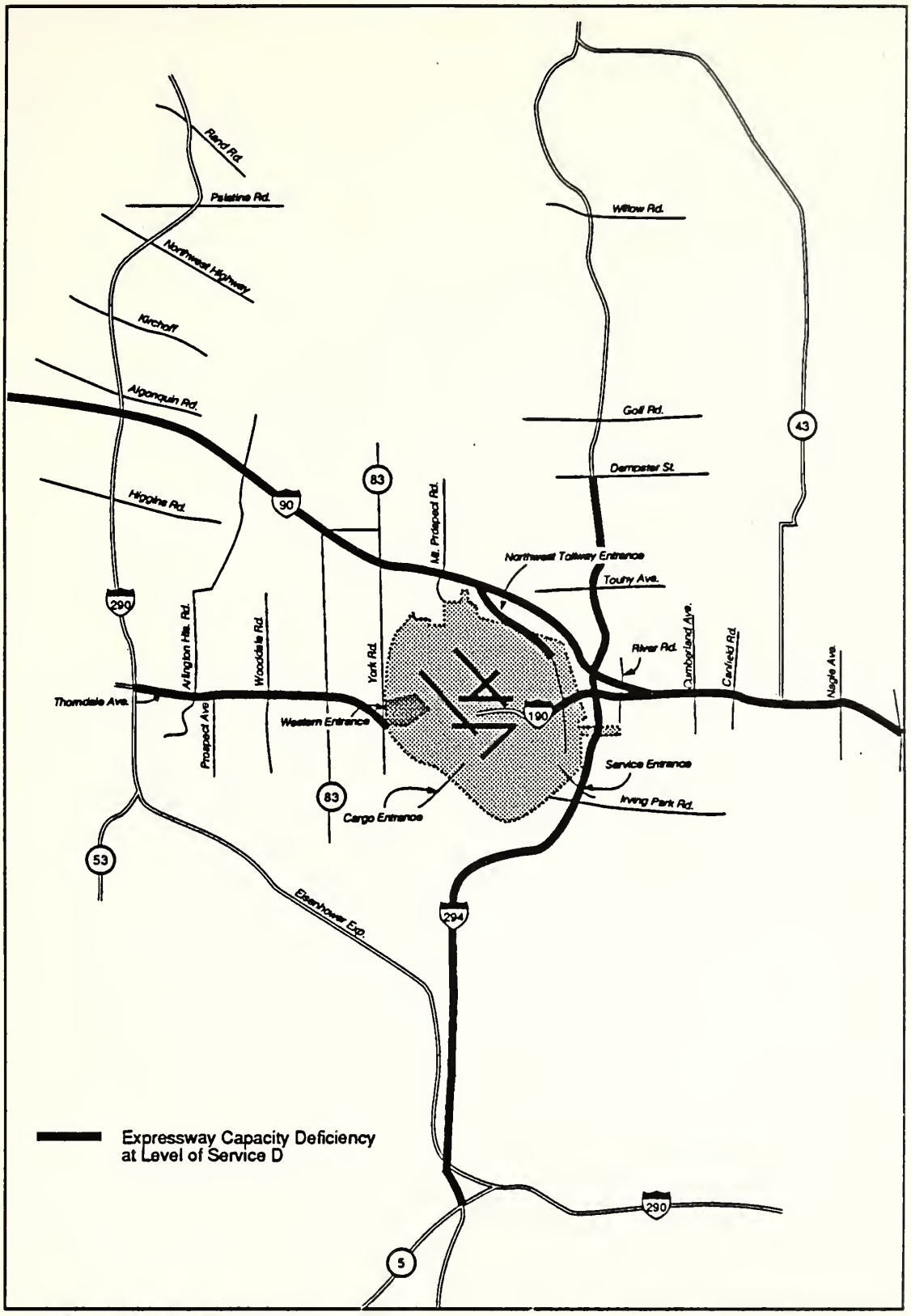
Exhibit C

Chicago O'Hare International Airport
Expansion Analysis

2020 INCREMENTAL AVERAGE DAILY VEHICLE VOLUMES ON ROADWAYS ENTERING THE AIRPORT

KPMG Peat Marwick

August 1988



Source: Chicago Area Transportation Study, May 1988.

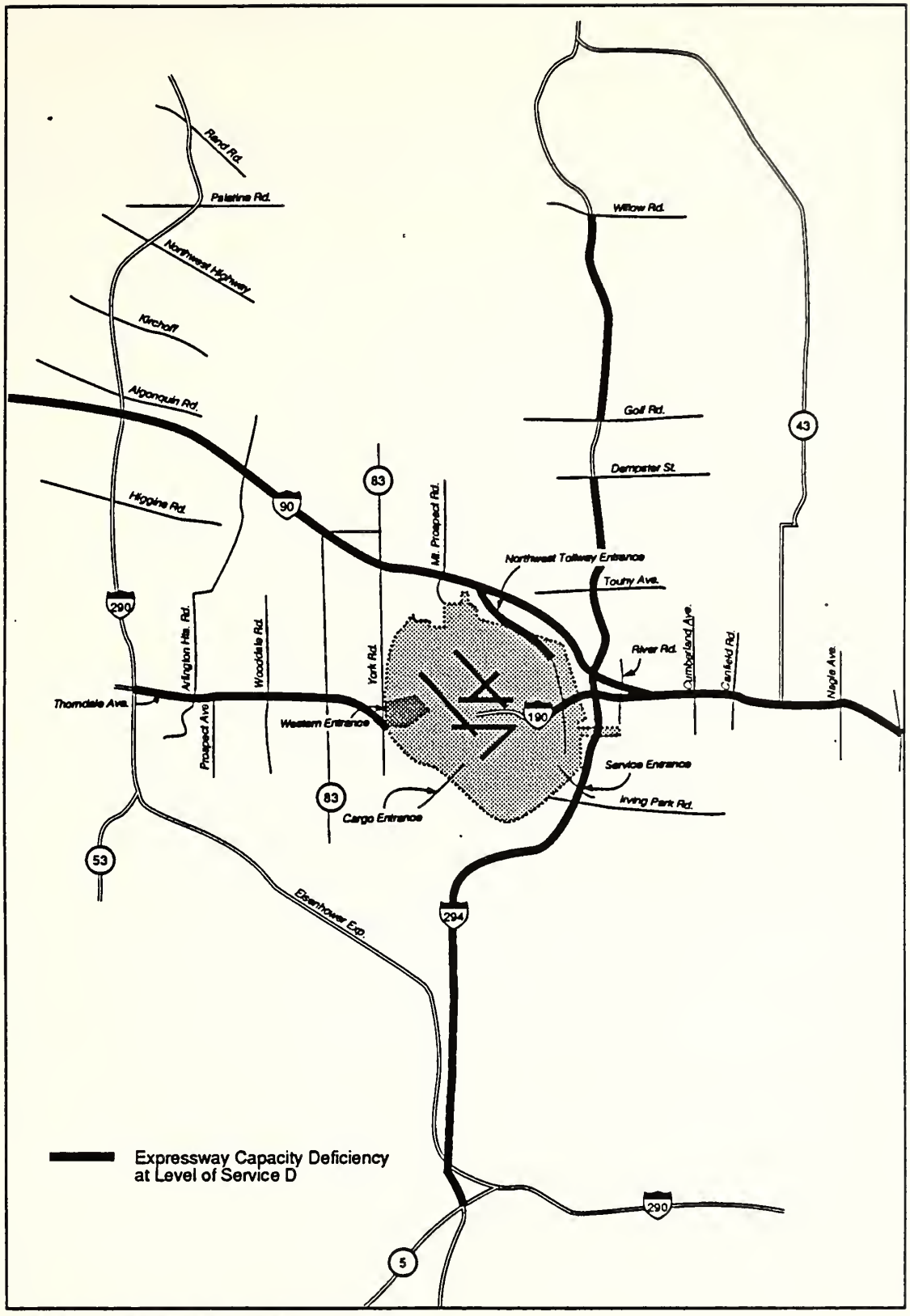
Exhibit D

Chicago O'Hare International Airport
Expansion Analysis

EXPRESSWAY CAPACITY DEFICIENCIES FOR 2020 ASSIGNMENT WITH 41.2 MILLION ENPLANING PASSENGERS

KPMG Peat Marwick

August 1988



Source: Chicago Area Transportation Study, May 1988.

Exhibit E

Chicago O'Hare International Airport
Expansion Analysis

EXPRESSWAY CAPACITY DEFICIENCIES FOR 2020 ASSIGNMENT WITH 60 MILLION ENPLANING PASSENGERS

KPMG Peat Marwick

August 1988

level, it is not possible to depict the individual arterial streets. The arterial streets which would be affected are discussed in the following section in terms of roadway expansion requirements.

A recent CATS highway analysis, "An Analysis of Ground Transportation to Chicago O'Hare International Airport," 1983, evaluated a number of alternative highway improvement programs for the year 2000. The analysis indicated that roadways in the vicinity of O'Hare could be improved to eliminate much of the congestion that would exist without such improvements. However, none of the alternative highway improvement programs would eliminate all of the capacity deficiencies. The analysis did not consider traffic congestion beyond the year 2000, or examine the financial, environmental, or political implications of roadway expansion. These topics would have to be addressed further in detailed planning of the roadway system.

OFF-AIRPORT ROADWAY EXPANSION REQUIREMENTS

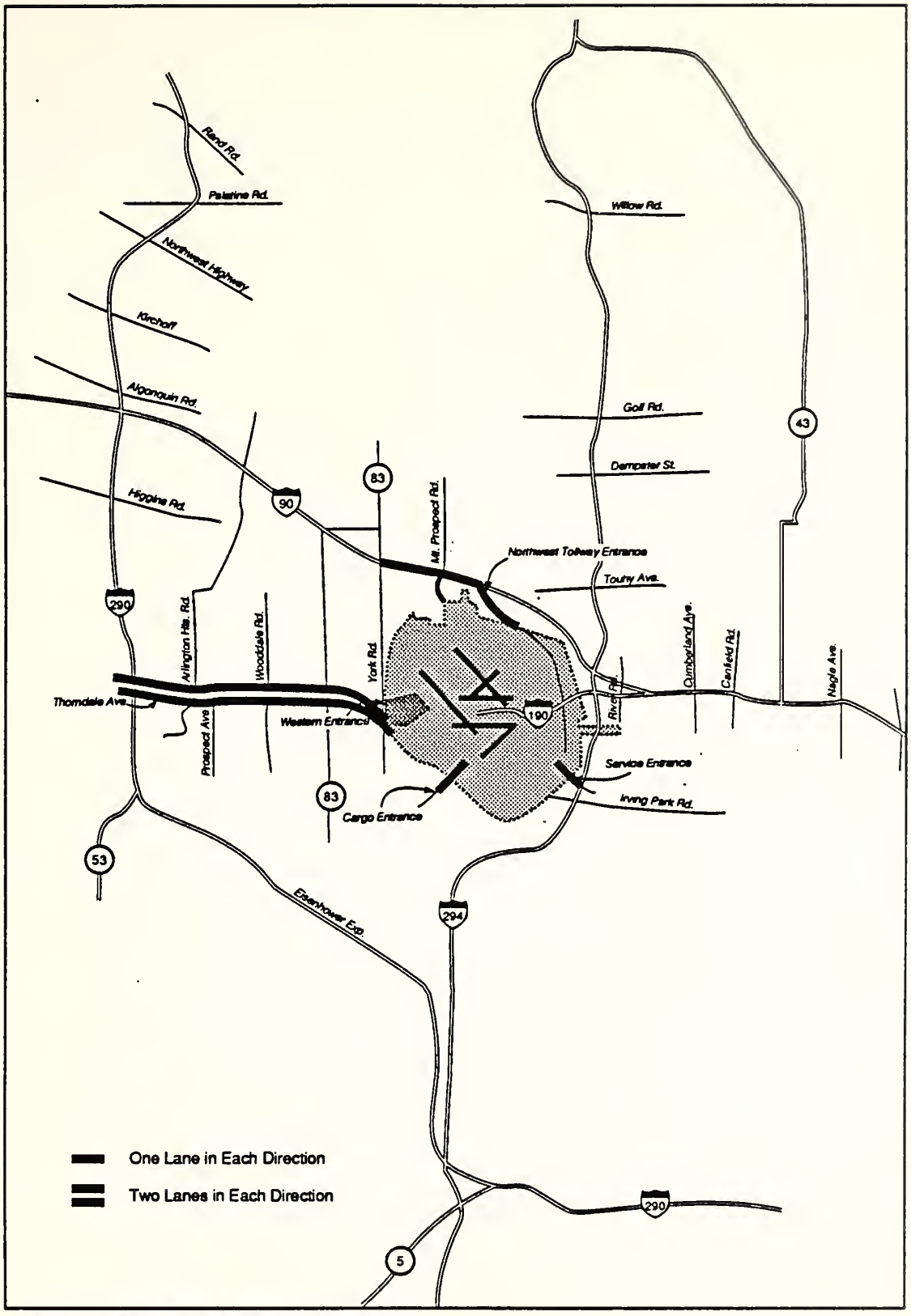
On the basis of the CATS traffic assignment results, incremental lane requirements were estimated separately for expressways and arterial streets.

Expressway Expansion

To estimate expressway expansion requirements, incremental ADT volumes were converted to peak-hour volumes. The peak-hour traffic volume was assumed to be 8% of the ADT. A directional imbalance in the peak hour was assumed to be 55% in one direction and 45% in the other direction. These factors permitted developing one-way peak-hour traffic volumes.

Additional lanes required to accommodate the incremental traffic were estimated using the same method as for the supplemental airport access analyses in the final report of the Chicago Airport Capacity Study. Incremental expressway improvement requirements were estimated on the basis of highway level of service D and an assumption that an additional lane would be required if the traffic volume exceeds 30% of one lane's capacity of 1,650 vehicles per hour.

Exhibit F shows the results of the expressway improvement analysis. One additional lane in each direction would be required on one section of I-90 from the Airport to York Road.



Source: Chicago Area Transportation Study, May 1988.

Exhibit F

Chicago O'Hare International Airport
Expansion Analysis

HIGHWAY IMPROVEMENTS REQUIRED FOR 2020 INCREMENTAL TRAFFIC

KPMG Peat Marwick

August 1988

Two additional lanes in each direction would be required on the proposed Elgin-O'Hare Expressway from the Airport to the Eisenhower Expressway. These improvements would provide capacity for level of service D only for incremental traffic.

An expansion of the proposed Elgin-O'Hare Expressway could be relatively easy to construct, if the plan included the incremental airport traffic requirements. Widening the Northwest Tollway, an existing elevated roadway, would be more expensive to accomplish.

Arterial Expansion

Arterial expansion requirements were estimated using a similar methodology as that used for expressways. For arterial streets, incremental roadway requirements were estimated by CATS assuming the capacity of one lane at Level of Service D would be 690 vehicles per hour. For each arterial street section in the network, the incremental vehicle demand was compared to the section's capacity. No directional imbalance was assumed. A lane would be required if the incremental traffic would exceed 30% of one lane's capacity. The total incremental lane requirements for each township were calculated.

The results of the analysis are presented in Table 11. The arterial lane-mile requirements are summarized for the four townships immediately adjacent to the Airport and for the region as a whole. As shown, 134 additional lane-miles would be required in the immediate townships and 312 additional lane-miles would be required in the region.

The implications of the expansion of 312 lane-miles (156 miles of arterial streets expanded by two lanes) cannot be interpreted in detail within the scope of this study. It can be observed that, because most of the arterials, especially in the vicinity of O'Hare, are developed with commercial, industrial, and residential land uses, expansion would require right-of-way acquisition and would be expensive. In many cases, complete strips of developed properties would have to be acquired along one side of the arterial. Considering potential environmental and political concerns, it is uncertain whether such properties could be acquired.

Table 11

INCREMENTAL ARTERIAL ROADWAY EXPANSION REQUIREMENTS
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study
2020

Township	Township location relative to O'Hare	Incremental lane-miles
Maine	Northeast	40
Leydon	Southeast	34
Elk Grove	Northwest	28
Addison	Southwest	32
Subtotal		134
Other townships		178
Total		312

Source: Chicago Area Transportation Study, May 1988.

ON-AIRPORT ACCESS ROADWAY IMPROVEMENTS

If the incremental traffic were accommodated at the new western terminal, the volumes of vehicle trips traveling to the existing terminal would be approximately the same in 1995 and 2020. Therefore, it was assumed that no appreciable road improvements would be required in the eastern part of the Airport beyond those called for in the Master Plan. Additional on-Airport roads would be required to support the western terminal.

As shown in Exhibit F, capacity deficiencies would be incurred on the three major service roadways--the Mt. Prospect Avenue entrance to the maintenance area and the entrances to the cargo and service areas. One lane would be required in each direction for those roadways.

More detailed study beyond the scope of this analysis would be required to determine ways to reduce congestion at these entrance points.

Chapter 7

CAPITAL COSTS

INTRODUCTION

Preliminary estimates of construction costs for development of the O'Hare expansion concept were prepared by McDonough Associates, Inc. The estimates we based on (1) requirements determined by Peat Marwick, (2) historical cost data for O'Hare provided by the City of Chicago and O'Hare Associates, and (3) professional engineering judgments.

The estimates were prepared to compare the magnitude of costs that could reasonably be anticipated in the expansion of O'Hare with the costs that were estimated for development of a supplemental airport in the Chicago Airport Capacity Study. They represent 1987 construction costs only and were prepared at the same level of detail as the other estimates. At later stages in planning, detailed analyses would be required to determine more precise construction cost estimates.

COST ESTIMATES

Table 12 summarizes the cost estimates for the expansion concept. The greatest costs would be associated with new utilities and facilities, airfield paving, terminal building construction, on-Airport transportation, and an off-Airport access road spur from the proposed Elgin-O'Hare Expressway. The cost items listed in Table 12 are described in the following paragraphs.

Land Acquisition

Land acquisition would be required for access road right-of-way for the spur from the proposed Elgin-O'Hare Expressway to the western terminal. Right-of-way acquisition costs were estimated to be $50 million.

Utility Removal or Replacement

An allowance of $3 million was provided for utility removal and replacement and for temporary utility installation that would be required during the construction period.

Table 12

SUMMARY OF COST ESTIMATES FOR O'HARE EXPANSION CONCEPT:
CASE 4
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study
2020

Cost item	Cost
Land acquisition for access road right-of-way	$ 50,000,000
Utility removal or replacement	3,000,000
New airport utilities and facilities	145,600,000
Earthwork	23,500,000
Airfield paving	178,100,000
Landscaping and fencing	5,200,000
Terminal area construction	661,800,000
Off-Airport transportation	120,000,000
On-Airport transportation	367,200,000
Temporary facilities	10,000,000
Subtotal	$1,564,400,000
Engineering, administration, and inspection	153,300,000
Contingency	515,300,000
Total	$2,233,000,000

Source: McDonough Associates, Inc., May 1988.

New Utilities

Cost items for new utilities include the following:

Cost item	Cost estimate (millions)
Water supply	$ 2
Electrical lines and a substation	20
Boiler plant	60
Telephone system	15
Sanitary sewer lift station and force mains	2
Heating, ventilation, and air conditioning facility	15
Gas lines on site	10
Drainage channel relocation	10
Fuel lines and fuel farm expansion	12
	$146

The total cost for new utilities was estimated to be $146 million. That estimate is of the same magnitude as the estimates for the new sites for a supplemental airport.

Earthwork

Grading for the terminal area was estimated to be $10 million. Earthwork for storm water detention was estimated to be $13.5 million. The total cost for earthwork was estimated to be $23.5 million.

Airfield Paving

Airfield paving would include (1) taxiways on the undeveloped western area, (2) taxiways on the developed airfield required for taxiing to the western terminal area, and (3) new apron paving.

Under Case 4, the total cost for airfield paving at O'Hare was estimated to be $178 million, compared to $241 million for a supplemental airport (excluding runway lighting and navaids).

It was estimated that approximately 19,900 linear feet of taxiway would be required in the western area to provide access from the terminal area to the airfield. An additional 20,700 feet would be required on developed airport areas to

allow aircraft movements for aircraft that would use the western terminal. Taxiway paving costs were estimated to be $62 million.

Apron paving area requirements per aircraft parking position would be greater at O'Hare than at a supplemental airport, because larger aircraft would operate at O'Hare. Paving costs for 670,000 square yards of apron area for O'Hare were estimated to be $117 million.

Terminal Area Construction

Terminal area construction includes the passenger terminal landside and airside buildings, baggage claim devices, loading bridges, and facilities for public, employee, and rental car parking.

Total terminal area costs were estimated to be $661 million. In this category, the terminal building and parking garage would be the most costly facilities. Terminal building costs for the landside and airside buildings were estimated to be $551 million. The parking structure above the landside terminal building was estimated to be $83 million.

Total terminal area costs were estimated to be about $463 million for a supplemental airport. Differences in costs are because of unit costs, airport requirements, and the complexity of construction. The unit cost for terminal building construction was estimated to be higher for development at O'Hare than for new airport sites. The difference in costs reflects the constrained space in which the facility at O'Hare must be built relative to new airport sites. Unit costs for terminal building construction would be higher at the undeveloped western area than for the new airport sites, but they would be less than construction at the main O'Hare terminal.

Off-Airport Transportation

Costs were estimated to be $120 million for the main access expressway spur from the western terminal to the proposed Elgin-O'Hare Expressway and the ground access circulation road at the western terminal. The high cost and complexity of construction would result from (1) building the roadways over the railroad tracks on the western Airport boundary and (2) accessing the three levels of the terminal building.

On-Airport Transportation

On-Airport transportation costs would include the cost of (1) constructing service vehicle roadways from the western terminal area to the main terminal, the maintenance area, and the cargo area, (2) constructing an intra-terminal people mover (secure from landside to airside), and (3) constructing an inter-terminal people mover (non-secure from western terminal to main terminal) and baggage transfer system.

The total cost for on-Airport transportation, including the people mover and baggage transfer systems, was estimated to be $367 million. Costs for an intra-terminal people mover were estimated to be $104 million; costs for an inter-terminal people mover were estimated to be $183 million; costs for a baggage transfer system were estimated to be $62 million. For comparison, an allowance of $200 million was made for a people mover and baggage handling system at a supplemental airport. At O'Hare, much of the construction of the inter-terminal people mover would require deep tunneling under the active airfield, whereas construction of the intra-terminal people mover in the western area or of a people mover at a new site could use the less costly cut-and-fill method.

SUMMARY

Total capital costs, including allowances for engineering, architecture, administration, and contingencies, were estimated to be $2.2 billion. That estimate is of the same magnitude as the cost of expanding Milwaukee General Mitchell International Airport under Case 2 ($2.2 billion*), the highest cost estimate for the candidate sites for a supplemental airport.

---

*Subsequent to the completion of this report, the State of Wisconsin, Department of Transportation, released preliminary findings of the master plan study now underway for Milwaukee's General Mitchell International Airport. An airport layout (not studied in the Chicago Airport Capacity Study) was identified and preliminary findings were that construction costs could be lower than estimated in this study. See Chapter 7 of the Final Report of the Chicago Airport Capacity Study.

Chapter 8

SOCIOECONOMIC AND POLITICAL ISSUES

This chapter was prepared by The al Chalabi Group, Ltd.

INTRODUCTION

The purpose of this chapter is to identify and assess the range of socioeconomic and political issues associated with expanding O'Hare operations beyond the level of improvement included in the current Master Plan. Socioeconomic and political ramifications and attitudes are reviewed in a qualitative manner that is relative to general conditions rather than to a specific plan.

The material in this chapter presents fair and impartial information on various viewpoints. The views summarized were gathered from interviews with a cross-section of (1) elected officials, (2) representatives of businesses, and (3) individuals and institutions that have followed developments in and around O'Hare for the last several years. A conscious effort was made to interview factions supporting and opposing expansion and representatives of both local and regional interests. Most of the opinions presented were expressed in full candor, with the understanding that there would be no direct attribution. Accordingly, a full range of issues was identified rather than the specific viewpoints of organizations or individuals. Conclusions about the validity of these viewpoints are not included, and only organizations that have made their positions public are referenced specifically.

In addition to soliciting various and diverse views through discussions and interviews, the study team reviewed the public records associated with the current expansion of O'Hare to obtain a more complete and long-term background on the issues. The qualitative reviews were augmented by the economic impact analyses reported in Chapter 9 of the final report, "Chicago Airport Capacity Study," June 1988.

This chapter is organized in three sections. The first section summarizes the views supporting continued expansion of O'Hare. The second section summarizes the views specifically opposing continued O'Hare expansion. The third section summarizes the views supporting development of a supplemental airport elsewhere in the region. The issue of a regional airport authority with oversight powers on O'Hare is not part of this study. However, many of the underlying positions--

particularly expansion support--relate to this issue, and therefore, it was too significant to ignore and is discussed in this chapter.

SUPPORT OF CONTINUED EXPANSION OF O'HARE

The economic benefits of airports, in general, and O'Hare, in particular, are documented in Chapter 9 of the final report of the Chicago Airport Capacity Study. Most of the stated support of O'Hare and its continued expansion is based on these well-known benefits. The Chicago Association of Commerce and Industry (CACI) and the Air Transport Association (ATA) have taken strong public positions in this regard. These organizations and other entities and individuals who support O'Hare's continued expansion also view O'Hare's airspace as very efficient, and they are concerned that the development of another airport in the region would reduce airspace efficiency.

Surrounding Commercial Development

The supporters of continued O'Hare expansion appear to be concerned more with the protection of existing service and commercial development than the expansion of either. Their major underlying fear is that the development of a supplemental airport is a subterfuge for the creation of a regional airport authority that would oversee and impose restrictions on the operations at O'Hare. In the opinion of these supporters, such restrictions, which might include night curfews or other limitations, would destroy O'Hare and eventually destroy the surrounding businesses that have developed because of their close proximity to the Airport. The immense size of this business development (commercial and industrial installations in the vicinity employ approximately 400,000 people) attests to O'Hare's attraction and the fact that entire communities have grown with the Airport. Many of O'Hare's night flights are cargo and business-related flights and, accordingly, raise special concern among business representatives.

The Role of Increased Passengers

When the issue of capacity at O'Hare is discussed, there is a consensus among most of the supporters of O'Hare, especially the business representatives, that the development of a new airport would be preferable to the loss of potential increases in passengers--even connecting passengers--to other

metropolitan regions. Very few organizations or individuals accept the concept that connecting passengers generate little or no economic benefits. However, most of the supporters of continued expansion are of the opinion that O'Hare is not operating at capacity and that there is adequate time to allow technological advances (use of bigger aircraft or other operating modifications) to increase its capacity (measured in terms of enplaning passengers). They contend that if such increases are not possible, there would be adequate time to look at alternatives.

Although O'Hare supporters recognize that it might be necessary to take additional steps, their eventual focus is on the immediate threat of a regional airport authority. The organizations and municipalities seeking to protect O'Hare (and its associated economic benefits) from intrusions, believe they have a responsibility to fight the threat to O'Hare's independence and continued dominance first.

Limitations of the Existing Infrastructure

Several professional planners from local universities are of the opinion that no additional airport can be built in the Chicago Metropolitan Area that can rival O'Hare's ability to generate economic benefits. O'Hare's location, access, and surrounding environment are all exceptional. This group argues that it would be more beneficial to continue to expand O'Hare rather than to build another facility. These advocates recognize the limitations of the urban infrastructure, especially the ground transportation system, and they suggest that expenditures in the magnitude of $1.0 to $1.5 billion may be necessary to upgrade the infrastructure system. This expenditure is in addition to the cost of expanding O'Hare Airport. However, even with this additional investment, this group believes that it would be a more cost-effective investment to continue to expand O'Hare than to build a supplemental airport.

Airline Operations in the Region

Several O'Hare supporters are also concerned that the airlines are not in favor of operating from more than one regional airport. Accordingly, many of the supporters are concerned that a supplemental airport would eventually become a replacement airport. This view is held irrespective of references to the stated assignment of the study--which is to have O'Hare continue as the primary air carrier airport in the region. Those who hold this opinion cite the example of

Midway Airport. One individual, familiar with other airport development, also referenced the airlines' demand to close Stapleton International Airport as a prerequisite to the development of a new airport in Denver.

OPPOSITION TO CONTINUED EXPANSION OF O'HARE

Many organizations and individuals believe that O'Hare is overcrowded, noisy, disruptive and, possibly, even unsafe. Some of them have supported past expansion of O'Hare; some have opposed both past and proposed expansion. With few exceptions, these organizations and individuals believe that the continued viability of O'Hare is essential to the economic well-being of the Chicago region, in general, and its northwest sector, in particular.

Disruption of Existing Communities

It was stated that O'Hare has already reached its capacity, and no further expansion can occur without new runway construction, land acquisition, and major improvements in general transportation. In the opinion of The al Chalabi Group, such steps would involve substantial land acquisition that could disrupt or even destroy existing communities.

The most vocal representative of this viewpoint is the Suburban O'Hare Commission (SOC); however, SOC views are not necessarily those of all expansion opponents. SOC is a group of 14 municipalities representing approximately 400,000 residents and one county (DuPage) in the vicinity of O'Hare. The member municipalities of SOC are parties to the consent decree that allowed for the current expansion of O'Hare (as defined in the Master Plan). However, they have been involved in litigation, administration actions, and political activities trying to restrain "additional" or "unlimited" development of O'Hare. SOC is accused of wanting to close O'Hare; SOC leadership argues that this is not the case. However, until comprehensive and "truthful" policies about accommodating future aviation demand are reached, SOC members believe they cannot trust any statement regarding O'Hare. Since signing the consent decree for the expansion of O'Hare, the SOC leadership believes that it has been betrayed, because the spirit of the decree has not been followed even though the strict interpretation of the decree wording may be followed.

Safety and Environmental Problems

The arguments against continued expansion relate to the long-term debate on balancing the transportation access and economic benefits of airports with environmental and safety problems. The majority of opposition is concerned that continued development at O'Hare will create tremendous safety and environmental problems that will outweigh the additional economic benefits.

Economic Benefits of Connecting Passengers

According to some observers, there has been a shift in some of the arguments between groups that support and oppose continued expansion. For example, the groups were informed that the economic benefits provided by connecting passengers were one of the justifications for past expansion. Accordingly, the groups are now arguing that the region should aggressively pursue capturing all possible connecting passengers through the construction of a new supplemental airport. While the groups agree that increased airport capacity encourages economic development, they are equally convinced that the areas surrounding O'Hare can no longer accommodate such growth. Consequently, they believe there are only two logical outcomes:

1. The economic development would not be realized, thereby squandering the spin-off potential of a major and costly public improvement.

2. The area surrounding O'Hare would be dramatically changed from its current partially residential character to one accommodating only commercial uses.

Managing Land Development

Trying to negotiate a middle ground between those two outcomes would entail major disruptions in the existing development pattern and considerable congestion in the ground transportation network. Most of the municipalities surrounding O'Hare are very concerned about managing development. Several of those interviewed have said that "grid-lock" is already occurring in the area's major arterials as well as expressways. There is great concern that continued, unchecked expansion of O'Hare would be a disbenefit.

Evidence of impending saturation in the O'Hare area is found in recent real estate reports and developer/broker concerns

about the inability of many developers to acquire nearby land at reasonable prices. The desirability of the area has increased land values to the point where only first-class, very high density, or high-rise development can be justified. The high densities would cause major traffic congestion.

In the view of some, it is not only land adjacent to O'Hare, but O'Hare land, itself -- land set aside for non-Airport urban development -- that might be jeopardized by continued expansion of O'Hare. One entity very familiar with the 1982 Airport Use Agreement is most concerned that the approximately 1,000 acres set aside for private commercial development may be required for aviation purposes. This land was designated in the 1982 use agreement as an "economic or "collateral" development area. One half of the revenues generated by its sale or lease is to go directly to the City of Chicago's general revenues. In the opinion of those concerned, the land's lease value is approximately $80 million annually.

Airport Employee Transportation

In the opinion of a few transportation officials, a third concern over expansion of O'Hare is the increasing disadvantage placed on airport employees from the City of Chicago. Under the Master Plan, the employee parking lots would be moved to the northwest corner of the airport. This, they argue, would add another 15-20 minutes to the daily work trip for many employees.

SUPPORT FOR DEVELOPING A SUPPLEMENTAL AIRPORT ELSEWHERE IN THE REGION

In the opinion of many elected and appointed officials, and business and governmental representatives, airports are important catalysts for economic development. These individuals further believe that properly developed, airport-associated economic benefits can considerably outweigh associated environmental problems.

Adoption of Public Support Positions

Several existing businesses and governmental associations have adopted public positions advocating the development of airports in their specific subregions. In addition, several new organizations have formed to promote specific subregions

as potential sites for the new airport. The most active of these organizations are those associated with the promotion of the Gary Airport and one of any of the new sites of Kankakee, Peotone, Bi-State, and Prudential. Chapter 11 of the final report of the Chicago Airport Capacity Study addresses the political acceptability of the sites.

Shared Regional Benefits

The important observation that must be reported in this section is that almost all the organizations supporting a specific new airport, with the exception of those supporting the expansion of Milwaukee, are also strongly opposed to continued expansion of O'Hare. These organizations and individuals argue that, as a whole, the benefits to the region, as a whole, would be greater if a new airport were developed. In their opinion, forcing all potential growth to the area around O'Hare is no longer the most highly leveraged alternative and is not fair to an area which remains under-served and too remote to benefit from any O'Hare development.

All the new sites have the opportunity to accommodate major new development, because they are located on the existing edges of urban development. Consequently, controls and provisions not contemplated at the time of O'Hare's development in the late 1950s, now could protect future residential areas from the environmental consequences of airport development.

SUMMARY

Because of the wide spectrum of concerns and views solicited, the consultants have not attempted to develop a resolution or conclusion. However, there are several summary observations that can be made, as follows:

- Supporters of continued development of O'Hare are primarily concerned with protecting and maintaining O'Hare's dominance. They are concerned that restricting growth at O'Hare would be economically undesirable.

- Opponents to continued expansion of O'Hare desire to set agreed upon reasonable limits on future operations at O'Hare, not to diminish its role as the premier national airport.

- Supporters of continued airport growth and its attendant economic development who do not support continued expansion of O'Hare would have supplemental airport located in an underserved and underdeveloped area of the region.

There is convergence of several political forces. The first two groups identified above could be satisfied by capping but maintaining O'Hare's traffic at a specified and fully agreed to level, without imposing a regional airport authority. Developing a supplemental airport at an area currently unserved would satisfy many of the remaining elements. This later view assumes that the operation of a supplemental airport would not conflict with operations at O'Hare.

It is the opinion of the Consultant Team that the issue of capping is very important to communities in the vicinity of O'Hare. The fear of these communities is that they will be acquired to be replaced by runways for an ever-expanding airport. There has been an implied promise that no additional land will be acquired for O'Hare. The consultant never received the impression from supporters of the expansion of O'Hare that such expansion would continue regardless of cost or dislocation of communities. If this is the case, a structured agreement on capping would be to the benefit of both sides. The issue which still needs resolution is the size and nature of the cap.

Chapter 9

OTHER CONSIDERATIONS REGARDING AIRPORT EXPANSION

As indicated in Chapter 5, the undeveloped western area was selected for terminal development because it appeared to best satisfy three principal considerations:

1. The availability of land area--in one contiguous site within the existing Airport property--to provide the additional passenger terminal facilities required to accommodate the 60 million enplaned passenger activity level

2. The ability to build additional passenger terminal facilities without unreasonable costs and with the least impact on the operation of the existing main terminal and airfield

3. The ability to provide the highest degree of flexibility in developing passenger terminal facilities, taxiway and apron layouts, and access roadway facilities

OPERATION OF THE WESTERN TERMINAL

It is envisaged that the western terminal would be occupied by domestic airlines with a relatively small market share of the O'Hare traffic. These airlines would generate a degree of interline transfer traffic with airlines at the main terminal.

Advantages and disadvantages of Airport expansion are addressed in the following paragraphs.

Disadvantages

There are four principal disadvantages to developing passenger terminal facilities not contiguous with the existing terminal.

1. Two Airport vehicular access points would be required. This could be confusing and disorienting to originating passengers and other motorists who make destination decisions while driving to the Airport. In addition, travel distances to the western terminal would be longer from downtown Chicago and other major areas of Airport traffic originations.

2. Duplicate terminals could be inconvenient for passengers who would depart from one terminal and return to another. Those arriving passengers would be forced to either (1) claim their bags in the arriving flight's landside building and then transit, with bags, by the people mover system to the parking facilities at the other landside building, or (2) proceed by people mover to their parked car in the other landside building and then make the lengthy and circuitous drive around the Airport to the arriving flight's landside building to claim their baggage.

3. Some interline connecting passengers would have to use the inter-terminal underground people mover to make their connections. Because of the length of the people mover ride, connecting times to the western terminal would be greater than those for interline or on-line connections at the main terminal.

4. The existing CTA system from downtown Chicago could not be extended to the western terminal. Therefore, travelers using CTA trains would have to change modes to reach the western terminal. Also, travelers using buses to travel to the Airport would have to either (1) know what bus to take to travel to the terminal at which his airline is located, or (2) if bus routes are not changed, bus users using the western terminal would have to travel to the existing terminal and use the inter-terminal people mover.

Because of these inconveniences, travelers might be biased against selecting airlines located at the western terminal. Likewise, it is expected that airlines would prefer main terminal locations, and it might be difficult to induce them to locate at the western terminal.

Advantages

Parking. Automobile parking would be provided for passengers in or adjacent to the western terminal. Therefore, walking distances from parking facilities to the western terminal would be less than those to the main terminal.

Servicing Activities. Adequate space relatively close to the western terminal appears available for flight kitchens and other airline servicing activities.

AIRCRAFT TAXIING AND AIRCRAFT DELAYS

Taxiing

As indicated in Chapter 5, taxiways would be added to enable all aircraft using the western terminal to taxi to all runways. For the most part, it would not be necessary for aircraft taxiing to or from the western terminal to share taxiways used by main terminal aircraft. However, compared with the main terminal, use of the western terminal would produce greater taxiing distances for the airlines.

A preliminary analysis was made of aircraft taxiing distances with and without a western terminal. Based on the future frequency of runway use,* approximate average aircraft taxiing distances would be as follows:

	Without a western terminal	With a western terminal
Average taxiing distance to western terminal	--	10,000 feet
Average taxiing distance from western terminal	--	11,900 feet
Average taxiing distance for all arriving aircraft	5,800 feet	7,000 feet
Average taxiing distance for all departing aircraft	7,800 feet	9,000 feet

Airfield Delays

The evaluation of expansion of O'Hare was based on the assumption that there would be 216 seats in the average aircraft. To attain this average, about 65% of the certificated and commuter aircraft would have to be widebody aircraft, compared with 44% without the expansion. The additional widebody aircraft would produce increased average aircraft delays because of aircraft spacing requirements to accommodate arrivals and departures. It was not within the scope of this analysis to estimate the magnitude of the increased delays.

---

*Source: Final Environmental Impact Statement, Chicago O'Hare International Airport, Appendix I, Page 300, May 1984.

Runway Crossing Delays

There would be additional runway crossings by aircraft using the western terminal. Nearly all aircraft operating at the western terminal would have to cross Runway 14R-32L. Runway 14R-32L would be used during daytime hours for about 22.6% of all arrivals and 9.5% of all departures. Runway 14R-32L would be used during nighttime hours for about 72.2% of all arrivals and 26.9% of all departures.*

AIRCRAFT NOISE

If O'Hare's terminal facilities were expanded to accommodate 60 million enplaned passengers, compared with lower numbers under other cases evaluated in the overall study, greater levels of aircraft noise would probably result. However, in terms of the Ldn noise metric, the increased noise would probably be small. Also, as Stage 3 aircraft become more prevalent, noise impacts will be lessened.

ACCOMMODATION OF LESSER DEMAND LEVELS

The 60 million enplaned passenger case that was evaluated is considered a maximum, given the capacity of the existing airfield. Lesser increases in the passenger-handling capacity of the Airport might be achieved, and the additional terminal facilities that would be required might be constructed in such a way as to reduce the impact of some of the problems cited above.

CONSTRUCTION DELAYS

Construction of the inter-terminal underground people mover/ baggage transfer system would interrupt operations on Runways 14R-32L and 4L-22R. It should be possible to phase the construction in a manner that only one runway at a time would have to be out of service. Alternatively, it might be possible to construct the people mover simultaneously with runway maintenance.

---

*Source: Chicago O'Hare International Airport Final Environmental Impact Statement, May 1984.

Chapter 10

SUMMARY OF EVALUATION

PRINCIPAL FINDINGS

The following paragraphs summarize the principal findings of the Chicago O'Hare International Airport Expansion Analysis.

Airport Average Aircraft Mix and Aircraft Characteristics

The aircraft fleet mix for the 60 million enplaning passenger activity level was developed to reflect the average of 216 seats per air carrier aircraft assumed under Case 4.

To reach an average of 216 seats per air carrier aircraft in 2020, the proportion of large aircraft in the aircraft mix would increase significantly from 1985. In 1985, there was an average of about 141 seats per aircraft. In 1995, there would be an average of about 163 seats per aircraft.* The mix of aircraft by aircraft weight class would increase as follows:

Aircraft class	Takeoff weight (pounds)	1985	1995	2020
Class D (heavy aircraft)	300,000 or more	15%	32%	65%
Class C (large aircraft)	12,500 to 300,000	84	56	30
Class B (small twin engine)	12,500 or less and some Learjets	1	12	5
		100%	100%	100%

The aircraft mix shown above includes all air carrier aircraft that would operate at O'Hare. For certificated domestic operators only, about 75% of the aircraft mix would be widebody (heavy) aircraft.

The sensitivity of the aircraft mix to aircraft seating capacity was analyzed, because the aircraft mix presented above includes an extraordinary number of widebody aircraft. It was found that if the seating capacities were increased to the maximum certificated amount for each aircraft, widebody

---

*The estimate of 163 seats were derived from the O'Hare Master Plan forecast of 41,200,000 enplaned passengers.

aircraft would still constitute about 56% of the aircraft mix at O'Hare.

Aircraft Parking Requirements

The number of aircraft parking positions at the main terminal was determined on the basis of the total terminal frontage (at 100 feet from the building face) that would exist in 1995* and the average terminal frontage required per aircraft in 2020. That number (120) was subtracted from the total aircraft parking position requirement (177) to determine the number of additional aircraft parking positions required (57) at the future terminal.

The aircraft parking position requirements were found not to be sensitive to the aircraft mix (in terms of increases in seats per aircraft on small and mid-size aircraft). The aircraft parking position requirements were found to be sensitive to assumptions on gate use efficiency. Increased gate use efficiency would result in lower gate requirements. However, fewer gates provided at a location other than the main terminal would result in more activity at the main terminal, requiring expansion there beyond the 1995 Master Plan expansion.

Location of Future Terminal Development

At a "sketch plan" level of analysis, it appears that it would not be feasible to accommodate terminal facilities for the 60 million passenger activity level in a contiguous area at the main terminal.

It appears that it would be feasible to accommodate additional terminal facilities for the 60 million passenger activity level in an undeveloped area on the western side of the Airport.

The western area would have sufficient land to provide a contiguous area for the additional passenger terminal facilities required for the Airport to accommodate the 60 million enplaning passenger activity level. The western area would create a western access point, which would preclude the incremental traffic at the main terminal.

---

*Based on measurements provided in the O'Hare Master Plan and by Landrum & Brown.

Although it might be desirable to continue expansion of the existing terminal area, significant expansion would require relocating Runway 9L-27R. Relocating Runway 9L-27R would involve (1) the relocation of U.S. Air Force property, (2) detailed studies of airspace implications, and (3) detailed studies of aircraft noise impacts. Although these activities could be significant, it was not possible at this level of detail to determine the feasibility of relocating Runway 9L-27R.

Access

The incremental traffic volumes associated with the increase in originating passengers from 1995 to 2020 were estimated using the CATS highway network model.

There would be major increases in traffic on the proposed Elgin-O'Hare Expressway and the Northwest Tollway. The model estimated that traffic on the Kennedy Expressway would not increase significantly because (1) traffic there would already be severely congested and (2) there are numerous arterial routes to which the model assigns [non-Airport] vehicles when expressways are congested.

A recent CATS highway analysis, "An Analysis of Ground Transportation to Chicago O'Hare International Airport," 1983, evaluated a number of alternative highway improvement programs for the year 2000. The analysis indicated that highways in the vicinity of O'Hare could be improved to eliminate much of the congestion. However, none of the alternatives would eliminate all of the capacity deficiencies. The analysis did not consider traffic beyond the year 2000, nor did it examine the financial, environmental, or political implications of highway expansion. Any such additional congestion would have to be addressed further in detailed planning of the highway system.

Based on the same method that was used to estimate incremental highway improvements for the new sites, (1) one additional expressway lane would be required in each direction on the Northwest Tollway (I-90) from the Airport to York Road and (2) two additional expressway lanes would be required in each direction on the proposed Elgin-O'Hare Expressway from the Airport to the Eisenhower Expressway (I-290).

For arterial streets, 134 additional lane-miles would be required in the townships immediately surrounding O'Hare, and 312 additional lane-miles would be required in the region.

The implications of expanding 312 lane-miles (156 miles of arterial highways expanded by two lanes) cannot be interpreted in detail within the scope of this study.

Capital Costs

Preliminary estimates of construction costs for development of the O'Hare expansion concept were prepared by McDonough Associates, Inc.

Total capital costs for airport expansion (not including highway improvements) including allowances for engineering, architecture, administration, and contingencies, were estimated to be $2.2 billion. That estimate is comparable to the cost of expanding Milwaukee General Mitchell International Airport under Case 2 ($2.1 billion), the highest cost estimate for a supplemental airport. The greatest costs would be associated with new utilities, apron and taxiway paving, terminal building construction, a people mover system, and the access road from the proposed Elgin-O'Hare Expressway to the western terminal area. The cost does not include improvements for the following:

- Expressways and arterial streets
- Access roads to entrances other than the western entrances
- The existing terminal complex

Except for building an inter-terminal people mover under the airfield, constructing facilities in the western area would not significantly compromise operations.

There would be virtually no potential for additional terminal expansion without expanding the Airport boundary. The feasibility of expanding the Airport boundary would be affected by the extensive residential and industrial development surrounding the Airport.

Social and Political Considerations

Social and political support is varied. Three summary observations about the spectrum of opinions are as follows:

1. Supporters of continued expansion at O'Hare are primarily concerned with protecting and maintaining the Airport's dominance. They believe that restricting growth at O'Hare would be economically undesirable.

2. Opponents of continued expansion at O'Hare desire to set agreed upon, reasonable limits on future operations. They do not wish to diminish O'Hare's role as the premier national airport.

3. Those who support continued airport growth and its associated economic benefits but do not support continued expansion of O'Hare would have a supplemental airport located in an underserved and underdeveloped area of the region.

There is a convergence of several political forces. The first two groups identified above could be satisfied by capping, but maintaining O'Hare's traffic at a specified and fully agreed to level without imposing a regional airport authority. Developing a supplemental airport at an area currently unserved would satisfy many of the remaining elements. This latter view assumes that aircraft operations at a supplemental airport would not affect the efficiency of aircraft operations at O'Hare.

Other Considerations

Aircraft Taxiing and Aircraft Delays. Taxiways would be added to the existing airfield to enable all aircraft using the western terminal to taxi to all runways. For the most part, it would not be necessary for aircraft taxiing to or from the western terminal to share taxiways used by main terminal aircraft. However, compared with the main terminal, use of the western terminal would result in greater taxiing distances for the airlines at the western terminal.

The large number of widebody aircraft would produce increased delays because of the extra spacing required to accommodate arrivals and departures. It was not in the scope of this analysis to estimate the magnitude of the increased delays.

There would be additional runway crossings by aircraft using the western terminal. Nearly all aircraft operating at the western terminal would have to cross Runway 32L-14R, which would be used during daytime hours for about 32% of all operations. Increased runway crossings at the Airport could impact the airfield capacity.

Airspace. In this analysis, it was assumed that O'Hare would be operating at capacity, with 920,000 annual aircraft operations. That number of aircraft operations is dependent on changes in FAA air traffic control systems described in Chapter 3.

Accommodation of Lesser Demand Levels. The 60 million enplaned passenger case that was evaluated is considered a maximum, given the capacity of the existing airfield. Lesser increases in the passenger-handling capacity of the Airport might be achieved, and the additional terminal facilities that would be required might be constructed to reduce the impact of some of the problems cited above. It was beyond the scope of this analysis to evaluate lesser demand levels.

SUMMARY OF EVALUATION

Table 13 presents a summary matrix of the evaluation of expanding O'Hare. The categories are the same as those considered in the evaluations of a supplemental airport in the Chicago Airport Capacity Study.

Table 13

SUMMARY OF EVALUATION OF O'HARE EXPANSION
Case 4[a]
Chicago O'Hare International Airport Expansion Analysis
Chicago Airport Capacity Study

Criterion	O'Hare
Demand	
Originating passengers (millions)	28.8
Access	
Passengers within 60 minutes (millions)	28.2-25.2[b]
Increased number of passengers within 60 minutes (millions)	--
Capital cost (billions)	$2.2
Economic analysis	
Total employment	n.e.
Total payroll (billions)	n.e.
Major environmental concerns	n.e.
Preliminary FAA airspace analysis	
Number of arrival fixes	n.e.
Political support	See Chapter 8
Long-term expansion potential	Industrial and residential development adjacent

n.e. = Not estimated.

a. The O'Hare expansion analysis was conducted only for Case 4. Lower demand levels were not evaluated.
b. First figure based on 1977 propensity to travel. Second figure based on equal propensity to travel. See Chapter 6, "Final Report: Chicago Airport Capacity Study," for more detail.

Source: Peat Marwick, May 1988.

AFA5740

11/2/2009
T 182088 1 117 00
HF GROUP - IN
GAYLORD